

EcoAdapt Working Paper Series N°3

Adaptation to climate change for local development

Generation of shared knowledge and joint learning on water governance and climate change adaptation

Kees Prins, IUFRO, (prins@catie.ac.cr)

Alejandra Cáu Cattán, IUFRO, (acaucattan@gmail.com)

Nataly Azcarrúnz, IUFRO, (nascarrunz@gmail.com)

Grégoire Leclerc, CIRAD, gregoire.leclerc@cirad.fr

Authors

Lead author: Kees Prins (prins@catie.ac.cr) has gathered the contributions, coordinated and written most of the article and integrated comments from the reviewers, developed the conceptual framework.

Co-author: Alejandra Cau Catán (vacaucattan@gmail.com) has provided written material in Spanish for the Argentina study site.

Co-author: Nataly Azcarrúnz (nascarrunz@gmail.com) has provided written material for the Bolivia study site.

Co-author: Grégoire Leclerc (gregoire.leclerc@cirad.fr) has provided ideas, extensive review, copy editing, rewriting and restructuring, and research management.

Contributors

Reviewer: Devisscher Tahia (tahia.devisscher@sei-international.org)

Reviewer: Bastiaan Louman (blouman@catie.ac.cr)

Reviewer: Michael Kleine (kleine@iufro.org)

Reviewer: Romy Cronembold (rcronenbold@fcbc.org.bo)

Contributor: Vignola Raffaele (rvignola@catie.ac.cr) provided ideas and references that helped design the conceptual framework.

Contributor: Alejandra Real (alejandra.real@conaf.cl) systematized the dynamic and fruitful November 2012 workshop in Chile.

Collaborators

Collaborator: Mariela Morales (moralesm@catie.ac.cr) has converted the deliverable 2.4 in Working Paper format.

Collaborators: the ABMJ, BMMAM, and FCBC Model Forests teams and the local actors whose efforts, information gathering and learning have been converted into this working paper.

Versions

Version 1: date (20/01/2014).

Table of content

Abstract.....	4
I Introduction.....	6
Purpose of the working paper.....	8
Procedure of constructing the working paper	8
II Conceptual framework.....	9
III Process and outcomes of joint learning and knowledge development in EcoAdapt	24
Mutual learning during the knowledge exchange workshop in Concepcion.....	24
Knowledge construction and learning during the diagnosis phase	26
Learning during the validation mini workshops of November 2012.....	27
Synthesis Workshops of April 2013	34
Fresh and purposeful learning after the mini and synthesis workshops	36
IV Analysis and synthesis.....	41
V From learning outcomes to inputs for action and strategy.....	45
Learning outcomes for strategy development, policy debate and political incidence	47
Acknowledgements.....	50
Consulted literature.....	50

Abstract

EcoAdapt(www.ecoadapt.eu) is an ambitious, complex and demanding action-research project about water security in a context of climate change. The issues the project deals with are also complex and demanding. A central challenge is how to get the investigators, the project partner Model Forest local teams and the relevant local actors in the territories on the same page. That is why joint knowledge development and shared learning from different sources and ways of knowing is of such strategic importance in EcoAdapt. Moreover, a viable and sustainable community based response to environmental and climatic challenges requires a critical mass of motivated, informed and concerted local actors.

To make good headway in this direction, an arduous but dynamic process has been set into motion resulting in a growing commitment and capacity building among the local actors in the three EcoAdapt territories.

The project's mini and synthesis workshops were building- and stepping-stones in a continuous path of joint learning and capacity development. In the former events the information captured in the base line study was discussed with the local actors, while in the second ones, the interest aroused was capitalized upon to form the change agents groups (an essential aspect of the EcoAdapt strategy) and to respond to the demand of more precise and accessible information, by means of a series of field learning activities. This had some promising outcomes such as contributing to a common interest and growing understanding of water as a central watershed ecosystem; widening of the horizon and view towards watershed and landscape management; strengthening of community drinking water systems with regards to its hardware and software (physical infrastructure, local management and governance); growing cooperation among urban and rural groups or between civil society and policy makers around water issues; creating a link between the legal framework and policy making and the processes on the ground.

A spiral of learning took place. As people satisfy their curiosity and initial interest they want to know more and understand better, and they become even more investigative as the activity gets geared towards action and towards helping them achieve their needs and aspirations. Learning does not stop and is clearly evolving in the project with regards to aims, content and methods. This proves to be entirely in line with one of the working hypothesis of the project and also with constructivist theories such as *meaningful learning*.

It has been fundamental and very instrumental to induce the formation of multi actor platforms of change agents in the three territories, through which the field learning activities are organized. These new instances are pivotal in the EcoAdapt learning and organization process by the local project partners: due to a broad representation of local groups and institutions, these platforms get grounded and obtain a growing legitimacy in the territory; they fill a real demand by tackling felt needs for local development around water issues and capitalizing human, institutional and financial opportunities and resources; information is spread and debated; trust and chemistry is built and a common language and vision developed; by lowering barriers between groups and institutions transaction costs are lowered and opportunities are taken advantage of to decrease operational costs and achieve higher effectiveness in ongoing or initial action around water issues and management. Hence it is also very cost effective in economic terms.

Climate change adaptation is a variant of risk management to secure water, food and other means of living. Management of climate risks is a millenarian old need and practice, but recent climate change tendencies give it a whole new dimension. Traditional knowledge and practice is a good springboard to climate change adaptation, but new science based information and views must be inserted in what people already know, do and want to change (or conserve) to widen their horizon and action alternatives, and create in this way, a solid

base for a viable and shared climate change adaptation plan. In that perspective it is essential that the complex issue of climate change is made transparent, understandable and meaningful. This still remains a great challenge in tactical and didactical terms.

The systematized experience so far teaches us that it may be necessary to deviate a bit from the project proposal (“description of work”, or DoW) in order to advance towards the project vision. So, in *Climate Change Adaptation for Local Development* (the project slogan) the relation between both aims is inter-active. Local development can be a starting point for advancing to climate change adaptation and ecological and social resilience. Close observation shows that the prime mover of action by the local actors has not been so much climate change adaptation but securing clean water in sufficient quality and quantity or satisfying other felt local needs and aspirations. And this is not just a matter of climate- but also of legal stress, and a lack of equity and legitimacy.

Hence, the internal learning and systematization has fed also the adaptive project management. Looking backwards and reflecting on it, one gets more clarity on how to go forwards to reach the vision. But therefore it is also important to look out of the EcoAdapt box and combine internal reflection with relevant literature and other cases, in order to get more out of the empirical data and process. Hence, much emphasis was put in this working paper on a relevant literature review, whose results merged in a conceptual flow chart, with the philosophy and strategy of EcoAdapt. In chapter VI *Analysis and Synthesis* the link is made between this flowchart with the process and outcomes of the field learning activities described in much detail in chapter V.

Many promising results were found as well as pending challenges which both are inputs for action and strategy in the next two years: momentum must be maintained, advances consolidated and a qualitative jump forward made. One of the lessons learned is the importance of combining tangibles and intangibles in water management to motivate participation of the local actors and enable their learning, organization and governance towards the desired change. It also shows the added value of EcoAdapt and how it gets the most out of its limited financial means.

Learning outcomes must be converted into input for strategic development, scaling out and up, policy debate and policy incidence. There is clear evidence that this process has already begun. Distances between actors diminish; policy makers get more involved; people become more knowledgeable on legal and policy matters and want to influence them or make better use of them; joint practice and understanding of water issues go hand in hand; scales of intervention are combined.

Scaling up is of strategic importance because community based environment management has a limited effect and does not make much sense if policy makers do not respond correspondingly. So, in order for intervention to be effective it must occur at different scales and be articulated. Both literature and the project practice confirm this need and possibility. It is also clearly foreseen in the project strategy expressed in the theory of change of the DoW.

A next central priority will be to incorporate, intelligently and tactically, the planned scenarios and measures of climate change adaptation within the activities and processes already in march in the three sites and organized around perceived local needs and opportunities, while at the same time doing the inverse - insert the ongoing activities in a broader framework.

A related central challenge in this perspective will be to stimulate in the coming years, a fruitful debate and clarity on water governance and conflict management in a context of growing water scarcity due to the effects of climate change and other stressors. A debate on “hotter issues” is quite feasible as more trust, chemistry and cooperation is built around non conflictive issues during start up activities, like what is going on at the moment.

As the literature shows, in the history of humankind, water scarcity does not necessarily lead to conflict and often has been a base for cooperation, social organization and synergy, depending on the rules of the game and the governance institutions in place and functioning. This will become an increasingly important issue in light of viable and robust adaptation plans to be made in the three sites in the course of 2014-2015.

I Introduction

The EcoAdapt project “*Ecosystem-based strategies and innovations in water governance networks for adaptation to climate change in Latin American Landscapes*” is supported by three pillars:

1. The conservation and restoration of Watershed Ecosystem Services (WES) for climate change adaptation and local development,
2. Innovation in water governance processes, with regards to the access of water among users and uses, and canalizing possible conflicts as a result of different interests and points of view,
3. The co-creation of knowledge and a critical mass of informed people who are committed to achieve the vision of the project, as expressed in the implementation strategy of Figure 1.

To move towards the project vision there is a clear strategy in place with a sequence of stages and steps to be taken:

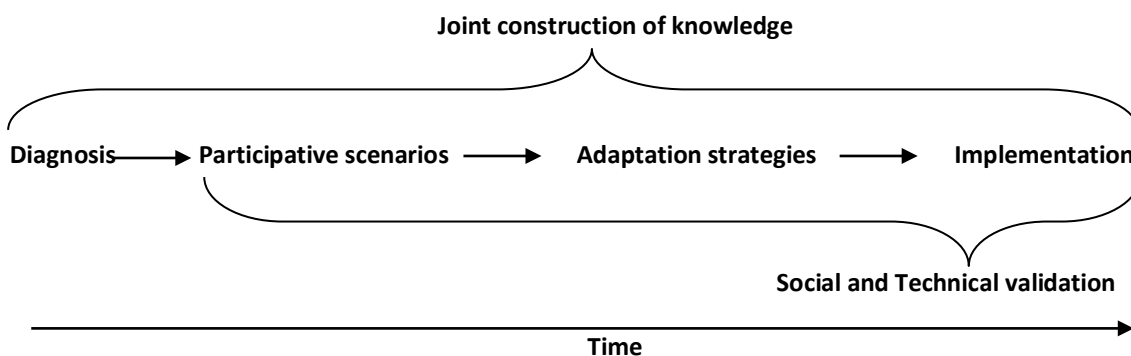


Figure 1. Philosophy and strategy of EcoAdapt

As shown in this diagram, the joint construction of knowledge is a central backbone of the project and an ongoing process¹. Therefore, this working document is an important means for analyzing learning processes and **intermediate outcomes** towards the project vision

The construction of shared knowledge involves the integration of different types and sources of knowledge in order to achieve the changes sought by the project. Knowledge is NOT transferred but co-constructed. This

¹Formal project activities related to knowledge sharing were completed in 22 months, but the joint learning goes on after this date although it takes other forms and content. It is geared at deliberation and informed and concerted decision making and is carried out by means of the newly constructed multi actor platforms of change agents.

means for this particular project that traditional, technical and scientific knowledge of different disciplines is being shared in order to construct a common knowledge pool for conservation and governance of the water resources, climate change adaptation and local development.

Hence, one must understand and interpret reality and development practice from various angles, disciplines and ways of generating knowledge, thereby creating a critical mass of individuals that are committed to push into the same direction. This process is called in the project terminology: the 'theory of change' or the road map for project implementation.

Likewise it must also be understood the strategic idea of forming change agents among key social actors in the three territories (Model Forest) where the project operates. Through these change agents, capacity and commitment is built within the groups and the institutions they belong to. Shared learning, dissemination and massive commitment are really at the heart of the project.

In the EcoAdapt philosophy and process **everyone learns and must learn**: the project designers and managers, the donor and evaluators, the various partners, teams and directories of the three Model Forests (MF) and the local relevant actors of these territories.

Transaction costs related to this learning process are high at the beginning, but will fall once the benefits become evident (we have already seen specific indicators of this) and once trust, chemistry and quality two-way communication are built up; once a common language is spoken and a clear and shared vision is generated about where we want to go and by what route. *If you do not know where to go, you will never have the wind in the sails* (as William of Orange used to say, national hero of a country of sailors).

Observing and reflecting on the experience gained, it may be necessary to deviate somewhat from the route traced in order to adapt along the way and advance towards the project aims and vision. So, adaptation to climate change for local development² is the central aim of the EcoAdapt project, but this does not mean that climate change adaptation necessarily is the best initial action and prime mover from the point of view of the local actors in the three territories. Other issues and felt needs may be better starting points for advancing towards climate change adaptation. This paradox will be later explained in this working paper.

Knowledge sharing is a continuous process of joint capacity building in an upward spiral. For this, it is essential to alternate action and reflection within an ongoing process of adaptive management.

These key aspects of the project are concretized and deepened in the course of this working paper, in which a broad conceptual framework and the knowledge and learning generated in EcoAdapt are compared the one with the other.

In this way, it is expected that this document will not only shed light on the road traveled so far, but also on the learning processes and capacity building which lie ahead.

In spite of the fact that the accumulated and reflected experience is still young, it is expected also that the outcomes of the report will feed the policy debate. Hence an additional final chapter is dedicated to this dimension.

²Adaptation to climate change for local development is the Spanish language slogan of the EcoAdapt project, agreed upon with the project partners in the three Model Forests.

Purpose of the working paper

The purpose of the paper is:

1. Summarize and analyze the processes and outcomes of joint learning and knowledge development by the associated project partners (researchers, MF teams, and local actors) in knowledge sharing and diagnostic stages (Work packages 1 and 2) and as a bridge to scenario development and planning stages (Work packages 3 and 4), with regards to the use and management of water resources by the different stakeholders in specific watersheds, in the context of climate change and local development
2. Contribute in this way to a shared understanding and capacity building by the relevant actors in the three Model Forests, and so enable them to advance with more clarity and commitment towards the EcoAdapt vision and objectives.
3. Provide some initial inputs to policy debate and policy making around the central issues of the EcoAdapt project, building on the outcomes and the lessons learned so far.

Procedure of constructing the working paper

We started by consulting the literature to elaborate an ample conceptual framework of processes and methods of knowledge development and learning, around the philosophy and central themes of EcoAdapt, in order to get the most out of the empirical process and help guide future tasks ahead.

The reconstruction of the empirical process and outcomes departs from the knowledge shared during the initial workshop in Concepción in May 2012 between the teams of three Model Forests (MF) and EcoAdapt³ researchers. Attention is paid also to the experiences and knowledge of the MF before EcoAdapt and in present times and which experiences are currently capitalized as valuable assets and inputs for the development of alternatives for intervention.

Afterwards, the essence of the knowledge generated in the diagnosis stage (and still to be refined and amplified) is summed up as discussed and discovered in the three mini workshops in November 2012, one in each MF, and later enlarged and deepened in the synthesis workshops in April 2013.

Finally, the process and outcomes of the field learning activities, initiated after and in follow-up to these workshops, are described and analyzed as far as they could be understood already. Central attention is given in this part to the multi actor platforms of change agents formed around the synthesis workshops, and through which the new field learning activities are organized⁴.

³It is a bit hard to set apart researchers in the Project from local MF teams. It gives the impression that MF teams do not perform research, which is not at all true. Their research methodologies may be somewhat different and as a matter of fact they combine action with fact finding and reflection within the scope of their activities and objectives. They could be named investigative and reflective practitioners.

⁴Process and outcomes of the field learning activities carried out in EcoAdapt, are extensively recorded in Deliverable 1.2. and presented more or less at the same time as this revised version of Del 2.2. Both deliverables are complementary and synergistic.

The main focus in this working paper is on EcoAdapt task 2.2: learning on adaptation to climate change, and decision-making in relation to water resources governance. We did not consider the learning acquired in the task 2.3 task: *'mapping and stakeholder analysis'*, because the findings, reflections and learning of this task have been already explained and included in Deliverable 2.4: *'Analysis of Socio-Institutional Context'*. Still, we make some reference to it sometimes because of the links between both deliverables as to learning for decision-making and action. For this reason, some reference is made also to task 2.4 on socio-ecological dynamics carried out in 2013.

A pause was made in the middle of 2013, as to ordering information and systematizing lessons learned for this report, although also trends were discovered and guidelines drawn for the work ahead. In this sense, this working paper is like a train station – just a point of arrival and departure for a train that keeps creating solid and useful knowledge for informed and purposeful action and policy debate.

II Conceptual framework

The conceptual framework is theoretical and practical. It is theoretical because it feeds on relevant literature about knowledge development and learning processes in the subject matter of the EcoAdapt project. It is practical because it gives useful criteria and guidelines for future work based on a better understanding of the learning dimension of the project.

The reader will encounter in this chapter the essence of learning; drivers and aims of learning; the way people learn and acquire knowledge; the central idea and reasons behind joint learning and knowledge development; the necessary conditions for learning; the articulation of learning and decision making between actors and scales of intervention. This is all related to the central themes and issues of EcoAdapt: climate change assimilation and adaptation, risk management, joint learning and acting in watershed and landscape management; community based response to environment and climate challenges; building of multi actor platforms; governance and rules of the game.

At the end of this chapter the conceptual framework will be visualized in a diagram in which the ideas of the literature and the essence of EcoAdapt merge. In chapter VI: *analysis and synthesis*, the diagram will be taken up again and connected with the systematized learning experiences of EcoAdapt of chapter V.

What is learning?

Learning is a subject matter, purpose and process.

Learning is an all-encompassing concept. Its subject matter has to be limited depending on the context, needs and the defined purpose, which in the case of the project was resumed in chapter II *Purpose of the working paper*.

Learning and generating knowledge are synonymous, to the extent that learning occurs inside the heads of people (or groups of people in the case of collective learning). Some say with good reason that one cannot transfer knowledge but only data and information, since the first one is formed inside the brains of people. When we refer to knowledge transfer and exchange, in fact, we mean passing on information and ideas for their sharing and assimilation. The term 'body of knowledge' refers to the set of findings and theories formed in the course of history, and stored in books (and other forms of knowledge sharing and application) and

transferred from generation to generation (if it is tacit knowledge it is passed on orally). This treasure of humanity is constantly evolving⁵.

This notion of knowledge development and learning implies that the emphasis is less on teaching (and much less filling empty heads with information), but on facilitating the learning process and assimilation of new concepts, approaches and tools, departing from what people already handle and want to understand better, according to their interests and aims. This is called *meaningful learning*, a concept we take up below.

A distinction should be made between knowledge and skills. The latter has a practical connotation and refers to expertise (know-how).

In the learning process and generation of knowledge, values and attitudes are to be incorporated because persons are motivated by values, interests and aspirations. In addition, science without ethics can lead to very harmful effects, as taught in the history of *Homo sapiens*.

In indigenous tacit knowledge, the ethical dimension is not separated from the cognitive one, which is expressed in values and behaviors such as respectful reciprocity between people and their environment, represented for instance in the concepts of the *Pacha Mama* (Mother Earth) and the *Apus* in Andean communities, and the *Ich'i* in the Chiquitania⁶ worldview. It is not easy to integrate indigenous world views and formal science. However, this world view is consistent with underlying values in the sciences geared to the protection of the environment and the planet earth. (Parotta et al 2012, Nashima et al 2012).

In the initial EcoAdapt knowledge sharing workshop in Concepcion, Bolivia, a comprehensive meaning of knowledge was adopted: Knowledge, Skills, Behaviors and Values (CHDCV) (De Melo 2011).

In this kick off workshop, the importance of the motivation that drives learning was stressed, with learning conceived as a continuous process, developed every time there are new stimuli to expand frontiers of knowledge. **Hence, learning must be seen as an ongoing and evolving process in an upward spiral.**

A distinction must be made between the education of children and adults. The first focuses on the development of the personality and talents of children, and prepares them for decision making of 'tomorrow' to make a living. Adult education focuses on a world where the only constant thing is change, and helps adults to form new criteria and tools with fresh outside information for making appropriate decisions in a changing world (Vorley et al 2013). Hence, new knowledge must be inserted in what they already know and have learnt in the school of life and what they want to understand better to be up to new challenges and opportunities.

The EcoAdapt learning processes focuses mainly on adult education⁷ and group learning. The latter includes personal learning but also learning networks and communities (Wenger 1998).

⁵At some point, a theoretical explanation may lose its weight and influence when another new theory or paradigm appears. (Kuhn 1962)

⁶ The Apus (Quechua Word for Grandparents) are sacred mountains with white heads because of the snow, to whom local villagers pay tributes because they provide water; The Ich'i in the Chiquitania region is an animal or other being that protects a lake or water reservoir, preventing it from drying. In both examples, there is an underlying concept of the value of protection and caretaking, and the need for a proper balance and reciprocity between human activities and nature, which has asoul in the indigenous worldview.

⁷ This does not mean that there are no activities aimed at young people. In the Jujuy MF there are many activities with local students promoting reforestation, which also involves the parents. In general, there are many communication channels between parents and child: the transmission from parents start at an early age and is mostly about traditional knowledge. In this globalized world, information and skills (such as

In this effort different views and knowledge around a central issue to be addressed, are integrated being this shared learning a central backbone in the philosophy and strategy of EcoAdapt and the Model Forests.

In the following paragraph, more light is shed on the drivers of the learning content and processes.

What do we learn for? The relation between learning, decisionmaking and action.

Learning is driven by motivation, interest and aspirations to achieve a desirable change (i.e. secure and improved livelihoods): to make the most out of given assets; for cost effective and environmentally friendly production; for the conservation or restoration of a natural resource; for risk management and adaptation to climate change. The primary motivation to acquire knowledge and skills is guiding future decisions and actions towards a desired change. So, poor people are driven mostly by the need to secure food, water and livelihoods under circumstances of environmental and climatic uncertainty (or other stressors such as the ups and downs of the market prices).

Hence, there is a clear relationship between learning and decision-making. To transform reality and solve problems, informed decisions must be made and appropriate and timely actions taken, which in turn requires a solid base of knowledge and skills. This is expressed among others in the theory of Keeney (1996) that decisions rely on knowledge already formed and new aspirations. With clear objectives in mind, a person or group can create alternative opportunities for choice and decision-making.

This coincides with the central view of Hindu Nobel Prize winner Amartya Sen, who argues that **sustainable human development** implies expanding the access to resources and widening the opportunities for individuals and groups to improve their livelihoods and enable their development. In this way, they become more free (Sen 1999).

Similarly, in his *liberation pedagogy*, the great scholar Paolo Freire, stresses the role of learning to empower the poor and excluded groups in society, and promote their inclusion and emancipation according to their rights, aspirations and potential (Freire 1970).

Livelihoods refer to assets, activities and capabilities, so they combine tangible resources and competences. The former imply physical, financial and natural capital, while competences refer to human and social capital, including culture and political advocacy. (Ashley *et al* 1999). The formation of human and social capital helps to conserve and get more out of the other types of capital.

Learning contributes to the development of abilities, tools and skills at the personal, familial or group level. Group learning is required to strengthen the capacity for organization and collective action. Personal and group learning often go hand in hand.

The dialectics of stress and new opportunities to cope with risks, and secure livelihoods

The combination of stress and new opportunities is a trigger for producers and communities, to search new information and acquire new skills. Crises are problems, although also opportunities for change (figure 2). This applies to innovations in the history of mankind, as expressed in the saying that *necessity is the mother of invention* (referred to in Prins 2005).

technological) sometimes move the opposite way, from child to parents. Such is the case of Facebook and other digital means of social communication.

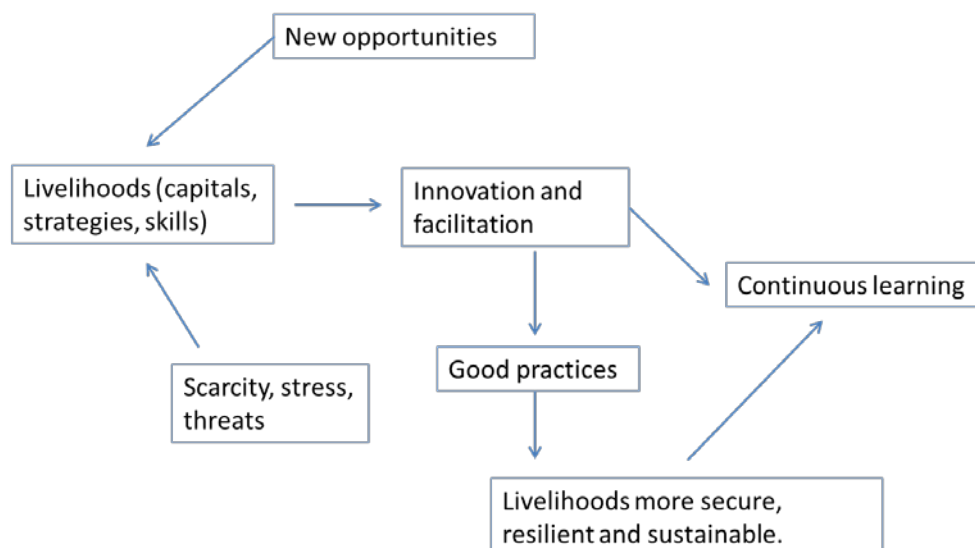


Figure 2. The encounter of stress and opportunities that trigger change (Prinset *al* 1999)

The combination of stress (problems to solve or barriers to overcome) and the occurrence of new opportunities is “fertile soil” for experimentation and innovation, in particular when facilitation, resources and support are available. Thus, problems lead to fact finding and implementing solutions to reduce the stress and secure livelihoods. If people are able to find effective and practical solutions to specific problems, they increase their adaptability and become more proactive and resilient.

This applies also to climate change adaptation as described in a recent FAO publication (AzisElberi et al, 2011) which emphasizes the importance of **climate smart agriculture**, which in great part consists of optimizing traditional agronomic practices and habits to reduce climate risk by farmers. This is also discussed in great detail in an interesting United Nation University publication, with the suggestive title: *Weathering Uncertainty* (Nashima et al 2012).

Coping with stress and catching new opportunities is at the heart of the matter of climate change adaptation, which implies reducing vulnerability and increasing ecological and social resilience.

Adger(2003) defines vulnerability as: *A state of susceptibility to damage from exposure to stress, associated with environmental and social change and with the absence of the capacity to adapt.* This definition is similar to the one by the IPCC: *Degree to which a system is susceptible to and unable to cope with the adverse effects of climate change including climate variability and extremes.*

Some traditional knowledge⁸ is an important treasure and trampoline to foster climate change adaptation and resilience. Past, present and future are linked, logically, in this way. **It is an important didactic and strategic asset, still not sufficient by itself⁹**, because extreme climate events today exceed the capacity of traditional

⁸In the Titicaca Lake, a bird builds his nest in the Totora plant; from the height of the nest built, people infer the level of rain and the water for the next year. In Alto Malleco, Chile, when the harvest of Piñones (nut of the millenarian Araucaria tree) in the autumn is abundant, the Mapuche communities expect a cold winter to follow, and they conserve a lot of nuts, this being an important part of their traditional menu.

⁹ A good example of traditional risk management is the *waruwaru* technology, ancient elevated lands in the middle of a marsh, which are being restored nowadays by communities, situated at the border of the Titicaca lake in Bolivia and Peru, in order to mitigate the risk of frosts, drought and other climatic conditions, and secure their food and livelihoods. The induced rescue and restoration of this old practice and knowledge to create

weather risk prediction and management. This too is emphasized and analyzed in the current literature. Hence, new and external information must be inserted into tacit traditional knowledge to deepen the understanding and widen the range of action alternatives.

The importance of time and scale for learning, action and innovation

Scale and complexity of problems and action are to be considered for effective intervention. When problems are complex (water, watershed, forest protection area, etc.) **decisions and actions must be taken at a larger scale, and the know-how needed must be up to this level of decision-making.** Figure 3 is borrowed from the International Food Research Institute (IFPRI) (Meinzen Dick *et al* 2004)¹⁰ and shows the scale, time and level of cooperation necessary to enable different types of desired innovation.

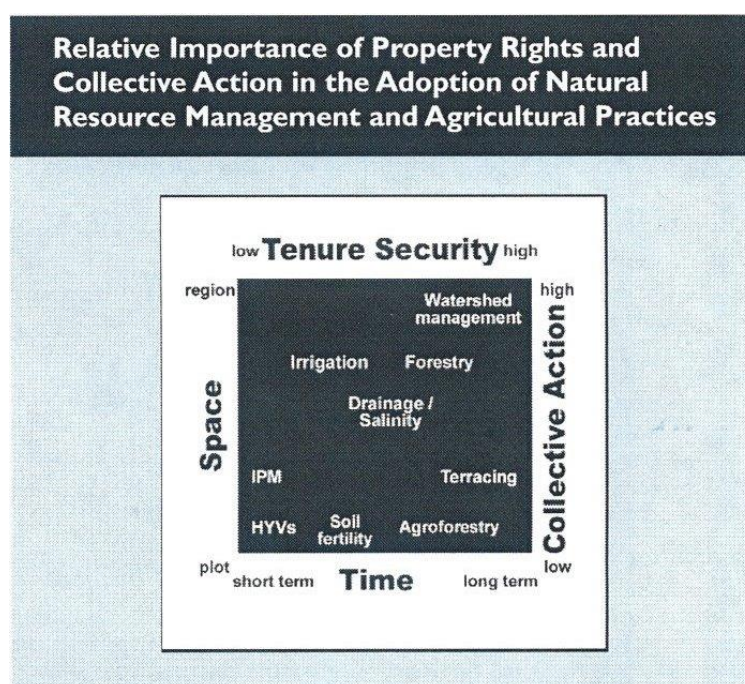


Figure3. Spatial and temporal dimensions of innovation (IFPRI)

Analyzing processes and conditions for innovation, the organization and time needed to solve a particular problem depends on the complexity of the problem and the action required. **The more complex a problem, the higher the level of collective learning, action and organization required**

Still, when it comes to solving problems at the farm level, it is also very worthwhile to apply group learning methods and exchange of experiences to share information and risks, lower transaction cost and obtain what a person alone, cannot achieve. With this regard, exchanges of experiences that are well supported are an

micro-climates and secure food production (a system that originated in the Pre-Inca Tahuanao epoch) contributes to actual and future adaptation measures to climate change in that zone.

¹⁰ The ideas expressed in this matrix, coincide with the findings and reflection in a book on innovation in Central America (Prins 2005), in which the importance of combining a temporal and spatial outlook is stressed in order to understand local processes of innovation at the farm level and at a wider scale of intervention.

effective vehicle to raise and equalize knowledge and skills, i.e. farmer field school cases, and farm planning. These exchanges act as arteries through which information and ideas flow. The metaphor of a communicating vessel in physics applies very well with this respect. Instead of water, the information flows and tends to equalize.

How do we learn and absorb new knowledge?

New information is inserted into what people already know (therefore in what has been learned previously). Without prior knowledge one cannot absorb and integrate new information, a way of learning called assimilation. According to the **assimilation learning theory** by the cognitive psychologist David Ausubel (2000) and the concept of **meaningful learning**, “*the most important single factor influencing learning is what the learner already knows*”. There must be some overlap between two concepts and ways of knowing to enable the new information to be anchored in the cognitive structure which exists already in the human mind. Using analogies and metaphors as well as concept mapping may help to make the link between new concepts and information, and the knowledge already formed in the mind.

This embodies the constructivist approach to learning and it builds greatly on the theory of the great scholar of cognitive development, Jean Piaget who states that **people learn by assimilation and accommodation. Learning by accommodation implies adapting old knowledge to new information and ideas**. This is a more difficult process of learning than assimilation and sometimes even traumatic because it implies unlearning ideas and it may go against common wisdom.¹¹ It is well known that often people filter new information so that this will be in line with established old ideas, which can be a barrier to widen the ‘frontier’ of knowledge¹².

Knowledge arrives by a variety of sources and channels and one learns in multiple ways: by transference of ideas and information from parents to children and by teaching at schools; through observation and practice in the school of life and professional practice; by exchange of experiences; through upgrading; via mass media such as newspaper, radio and television and in increasing way, internet. As a matter of fact learning is the outcome of a combination of all these sources, and it never stops!!

This applies also to a complex issue such as climate change, i.e. some may observe and feel manifestations of climate change directly, which is the case of the people who live and coexist with nature and whose livelihoods depend on food and fiber production; others learn by what radio, newspapers or television inform. One can also learn about climate change by various sources of information at the same time.

This seems to be the best way of training in adaptation to climate change: **to combine various sources of information: integrate what we know, based on observations and own experiences and add to it fresh information from other sources, widening and deepening the understanding**.

On the other hand **one learns and makes decisions at different levels**, at the farm level, at the level of an association of producers, committee of irrigators or a water management board, community or municipality, watershed and landscape. **The key and challenge is how to articulate and combine knowledge and decision-making at different levels of decision making and action in order to achieve a larger intervention impact**.

The importance of combining action and reflection as a learning and action device and its application in watershed and landscape management

¹¹ The most famous example in history comes from Galileo. His reasoning of the Earth spinning around the Sun (and not the other way around) caused him imprisonment.

¹² This explains the opposition of certain politicians and members of the society to accept scientific arguments about climate change.

Generation of knowledge and skills is enhanced when there is a continuous process of upward spiral action-reflection-action-reflection (providing feedback and raising the ability to plan and take action). In a sense, EcoAdapt is entering uncharted territory about water governance and security issues (except in Jujuy where the issue has been addressed in the past but was on hold in recent years) and has to discover (or reset) the path that leads to the desired change. **This corresponds with the idea of adaptive management: make readjustments according to what is learned on the way by reflecting on activities.** This is called a **Learning Wheel** (Senge 1990) which can be visualized in Figure 4:

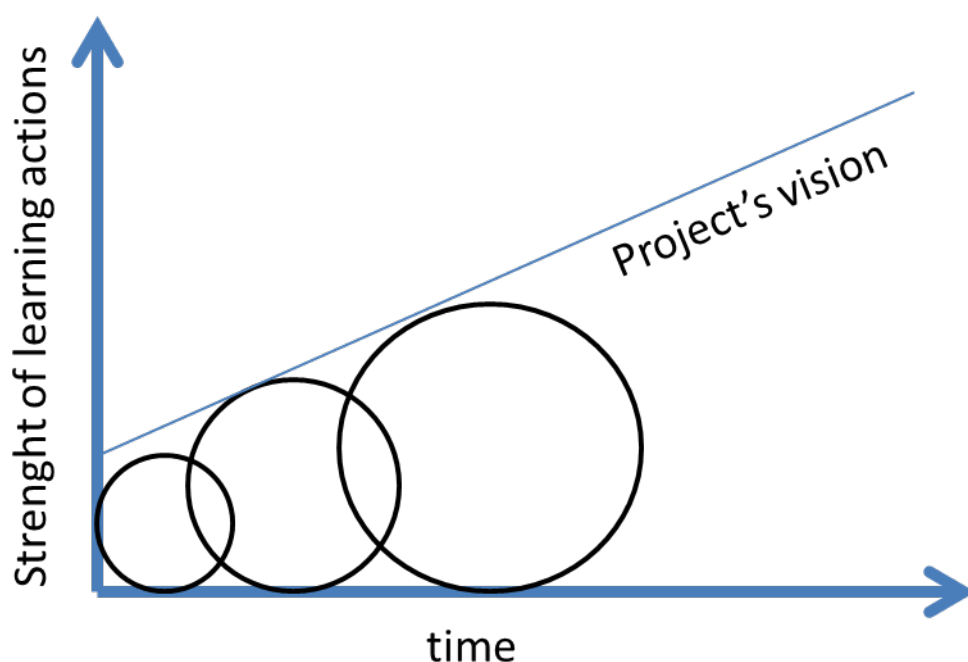


Figure 4. Wheel of learning (Prins according to Senge)

This way of planning and intervention coincides with the essence of action-research: to test new ideas, strategies and methods to solve concrete problems. This was demonstrated successfully in the CATIE FOCUENCAS II watershed program (Kammerbauer *et al* 2011; Leon and Prins 2010). Lessons from other programs at the watershed and landscape scale point to the same. An IUFRO publication about forest management governance emphasizes the importance of building experience through taking concrete steps around specific problems in order to accumulate experience and prepare the ground for addressing larger and more complex issues (Rayner *et al* 2010). Cashore and Galloway (2001) postulate a same incremental approach of adaptive management.

A similar way of thinking is expressed in the SLIM program (***Social Learning for the Integrated Management and Sustainable Use of Water***)¹³, as displayed in Figure 5: **the development of shared understanding among relevant actors, and changes in practices must go hand in hand, so that reflection and action will strengthen each other and contribute to the desired change at a watershed scale.**

¹³The SLIM program is a systematization of a series of projects and experiences in water and watershed management in several European Union countries.

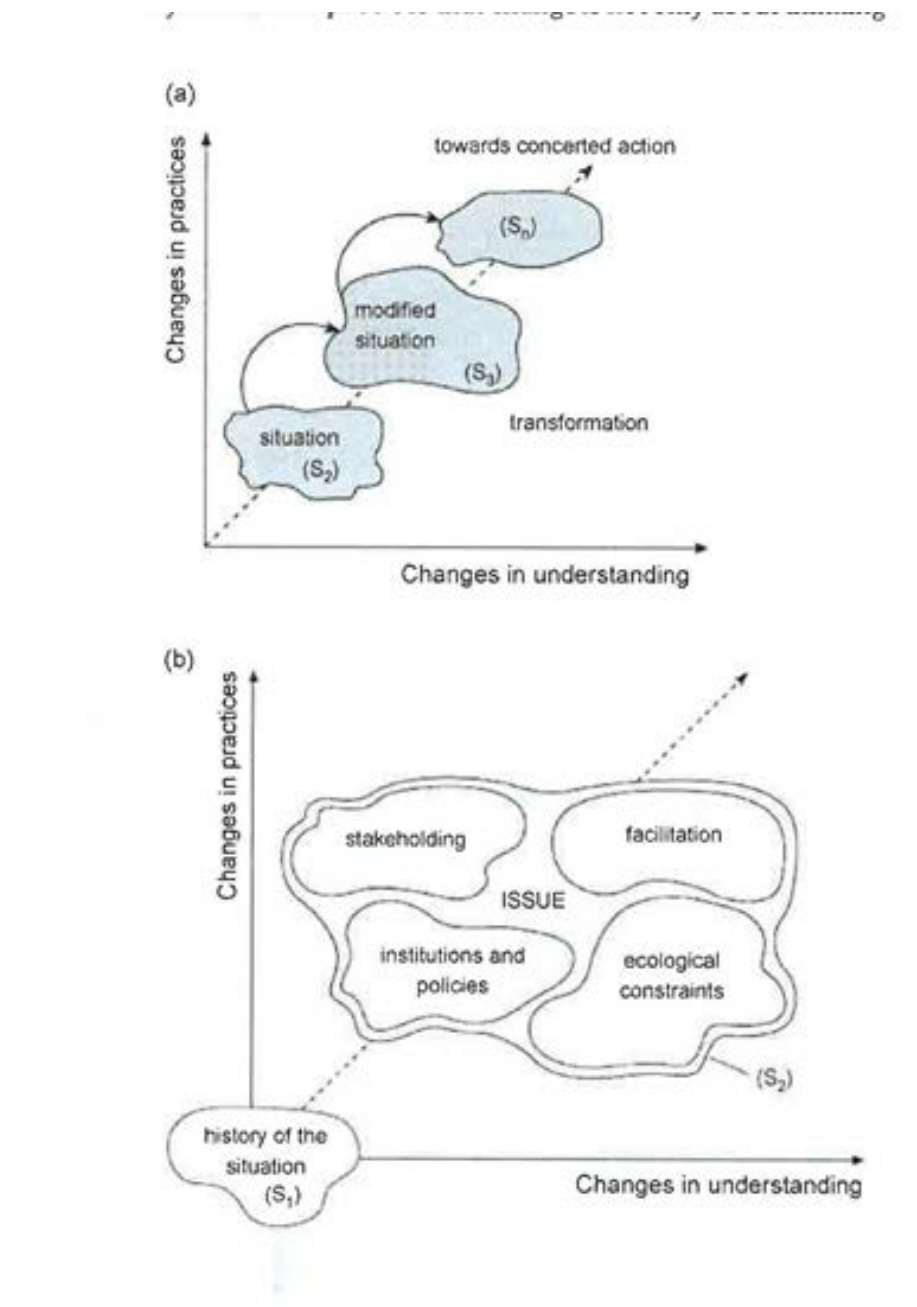


Figure 5. SLIM: changes in understanding and practices should go hand in hand to advance towards concerted action and desired changes in watershed governance

A related idea of the SLIM approach and experience, quite relevant for the joint learning approach of EcoAdapt, is that through the process of defining and discussing a central problem, one gets more clarity on alternative actions to resolve the problem See figure 6:

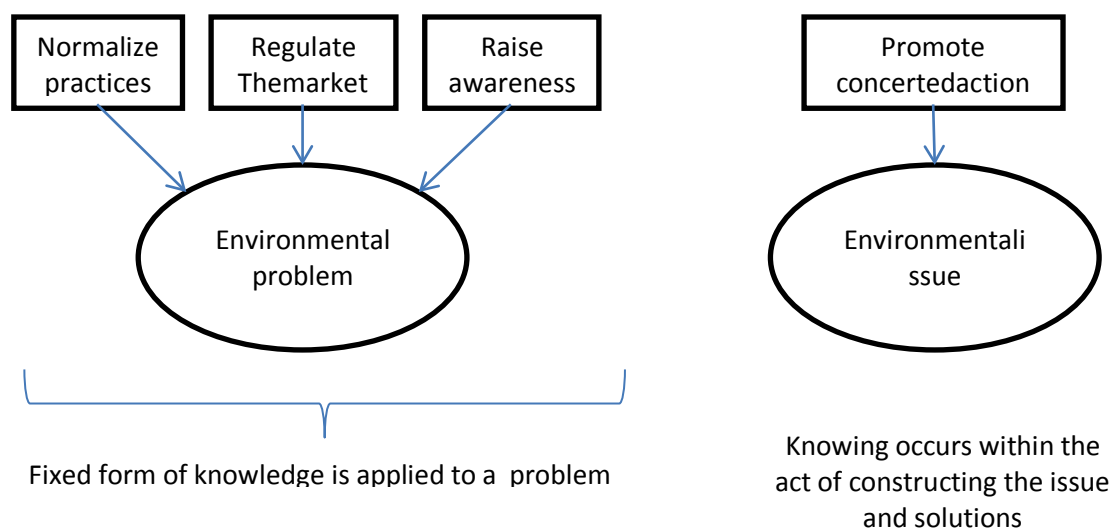


Figure 6. SLIM: Knowledge is generated in the process of constructing a problem and analyzing potential alternative solutions.

In the book *Realizing Community Futures* (Vanclay et al 2010), a similar thought is expressed. Joint learning and decision-making is compared with resolving a puzzle¹⁴. By resolving a puzzle, a common understanding and language is developed within a “joint enterprise” which enhances the chances to achieve a desired change.

The importance of cooperation and complementarities between scientists, technicians and lay people must also be seen in the perspective of jointly generating knowledge and achieving a shared goal. Nobody has got the (complete) truth. In the process, the roles can be modified too: scientists can start acting also as process facilitators, and lay people can become investigative and contribute to the development of new applied knowledge as a result of practical and reflected experience. In this endeavor, technicians often fulfill the role of interface (bridge), because they have one foot in the world of science and another one in the world of farming families and communities. With reason they are called “reflective practitioners”.

The importance of timely feedback in the learning and decision making process

To achieve successful interventions, a proper and timely feedback to learning and decision making is needed.

The literature refers to feedback as single loop, double loop or triple loop. The first relates to improved performance, which takes up the idea of experiential learning developed by Kolb. (Kolb 1984) and expressed in Figure 7. The second refers to a change of power, attitudes and values in order to make a qualitative leap, which is much more demanding (Pahl-Wostl 2009). The difference between first and second loop feedback is expressed as “*doing things right and doing the right thing*”. It also involves creating real conditions for change, **which is not just a matter of “Right” but also of “Might”**. (Pelling et al 2005)

¹⁴Making a puzzle is also a very interesting metaphor of shared learning and knowledge development, in the sense that different actors contribute different pieces of a problem and its solution, to be assembled to see the complete picture and to get more clues for acting when, where and how.

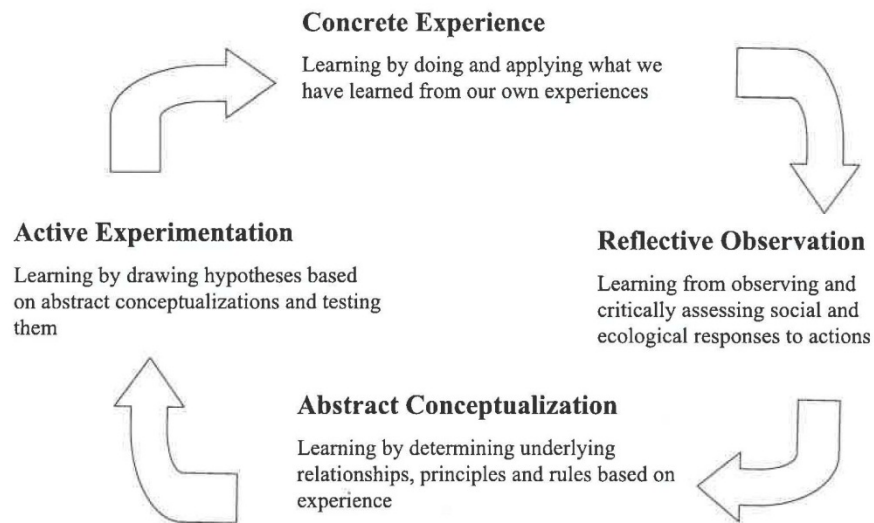


Figure 1. Learning cycle. Adapted from Kolb (1984).

Figure 7. The cycle of experimental learning, according to Kolb

Much of the literature refers to communities of learning, a concept developed by Etienne Wenger (1998), which applies to networks of scientists and reflective practitioners and also to activities where communities, farmers and extension agents share experiences and knowledge such as in farmer field schools (de Melo 2011). **EcoAdapt itself is a community of learning among project partners and local actors.**

Integration of perspectives and knowledge to create a critical mass for change

Achieving a substantial change and overcoming counter forces requires a critical mass of people, with a common will, perspective and shared knowledge. Their initial positions tend to diverge, there are different interpretations of the same reality, and knowledge is fragmented within people's heads, groups and institutions, so it is necessary to build a clear and shared strategy for change and take steps in this direction. Vicious circles of problems and not knowing must become virtuous circles of change and understanding. This is the essence of the EcoAdapt strategy: build and combine various skills, views and commitment to tackle a complex problem and to achieve the project vision. **In this perspective also the key value of integrating explicit scientific and tacit traditional knowledge, gets it logical meaning and place.**

Tacit knowledge thrives from knowledge that is transferred from generation to generation. It is what is learned in practice, in the school of life and in social interaction until it is put to proper value, acknowledged and incorporated into explicit knowledge.

Tacit knowledge also refers to knowledge that is hidden in the minds and skills of people working in an organization (territorial, productive or otherwise) and which remains an untapped resource to improve the performance and productivity of the community and organization¹⁵.

¹⁵ See the idea and concepts behind the quality control of Japanese enterprises, in which all employees are involved in the improvement and productivity of the company.

For its part, scientific knowledge is guided by processes according to certain general scientific principles and standards, according to the essence of each particular discipline (natural sciences, social or mixed). The information is transmitted relatively easy among peers because it is codified written and understood. At the same time it is not easy to transmit and make accessible this information to the general public.

Interdisciplinary exchange (integration of different bodies of knowledge and ways of knowing, to address problems of certain complexity and size) is much in vogue, but in practice it proves not to be that easy. A person is formed and sometimes formatted, in his/her professional field of education or context. Many times, one must learn and unlearn, and expand the frontiers of knowledge in an effort to integrate disciplines and perspectives¹⁶. Analyzing a problem from different perspectives and expertise helps to get a proper understanding of the multifaceted reality of a problem. This approach also helps to understand and appreciate colleagues from other sciences.

Integrating scientific and tacit knowledge is a two-way conversion process. First you must acknowledge and valorize traditional knowledge, then incorporate explicit scientific knowledge into tacit knowledge for its empowerment. This conversion process when knowledge goes from tacit to explicit is called externalization, and internalization when it goes from explicit to tacit, according to the Japanese scholar and expert on knowledge management, Ikujiro Nonaka (Nonaka *et al* 2000).

There occur also inner and horizontal processes of knowledge sharing, through scientific articles and congresses in science communities, or storytelling and sharing of experiences in and between rural communities. The procedures are quite different but the goal is similar: **Sharing knowledge for mutual benefit and enrichment.**

The effort behind joint knowledge generation and learning implies the application of interactive principles and teaching methods such as: learning by doing, discovering, experiencing, sharing and discussing. These techniques are applied in field schools, farm development plans, exchanges, internships, and action-research activities.

The exchange of experiences and knowledge integration requires skillfully managing the interface among specialists, technicians and producers, with regards to interests, points of views and skills. The English sociologist Norman Long has made this interface a center for attention and analysis in his theory of rural development (Long 2001). He conceives of reality as an arena in which a variety of actors share objectives and particular projects. The government (national and local) seeks to apply its policies in society, while civil society seeks to influence government policy. A development agency seeks to promote change with farming families according to the agency's mission, through their technicians. At the same time, families and the community have their own aspirations and projects (non-written), to which they expect the agency and technician to contribute. The technician is the interface in this example.¹⁷. Long refers to this as "*encounters at the interface*".

The concept of "interface" is very similar to the concepts of "bridging actors" and "boundary organizations", which also point to the need to close the gap in perspectives, knowledge and actions of different actors around a specific problem. Thus Vignola *et al.* (2013) analyzed the case of a project operating at the scale of a sub-watershed in Costa Rica, which sought to reduce the impact of erosion on soil fertility by the producers in the upper part and increase the timespan and functioning of a Hydropower company in the lower part of the watershed. This study highlights the important role played by an agency which provides technical assistance to

¹⁶ It applies also fully to the EcoAdapt project.

¹⁷ Interface has different meanings: being understood, being compatible; enabling common ground to reach an agreement for mutual benefit.

producers. Their technicians are key to facilitating two-way information, joining forces and achieving a shared understanding of the problem and the necessary intervention, for having the acceptance and trust of the producers and communities, for speaking a common language and for acting as an interface between local people and policy makers and scientists. **Trust and the quality of communication between institutions and local actors in a project are key assets for its functioning and effect.**

In the process of generating conditions for joint action towards a common problem, partners involved have to negotiate a common agenda, define different points of view, complement different skills and roles, and get the right balance of costs and benefits.

To facilitate joint learning, an adequate learning environment is needed which stimulates attitudes and conditions such as: curiosity, empathy, assertiveness, respect, trust, shared language, common interests. (Roux *et al*, 2007).

All this is expressed in the notion of constructivism, appreciative inquiry and the joint creation of knowledge. Actors are moved through particular and different perspectives and interests, so that the challenge in natural resources management is to find common ground and goals despite different interests. **The challenge is to convert divergence into convergence!**

A practical stepping stone for the creation of platforms for joint action and understanding for climate change adaptation is to invert negative things into positive ones. Common '*bads*' such as fires, drought, floods and other threats can be excellent entry points for building common goods: platforms for collective action to reduce the risks.

Visualization of conceptual framework for knowledge sharing and learning in action research

The ideas of the literature expressed in the foregoing, can be visualized and merged with the essence and strategy of EcoAdapt by means of the following flow chart (Figure 8):

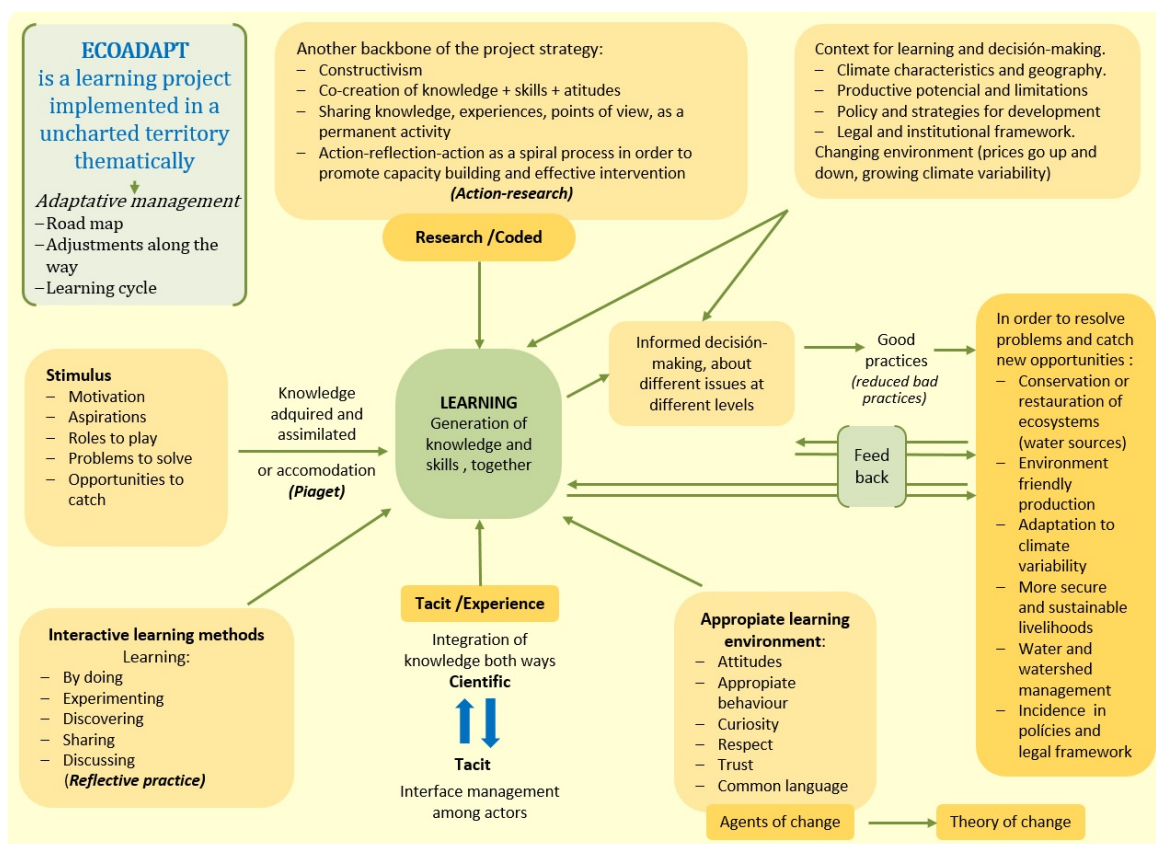


Figure 8. The central role of joint learning in the EcoAdapt context and implementation.

One recognizes in this conceptual framework flow chart the convergence and some divergence with the flowchart and conceptual model to analyze socio-ecological dynamics (task 2.5) which was presented and discussed at the May 2012 initial workshop in Concepción and during the synthesis workshops of April 2013 (figure 9).

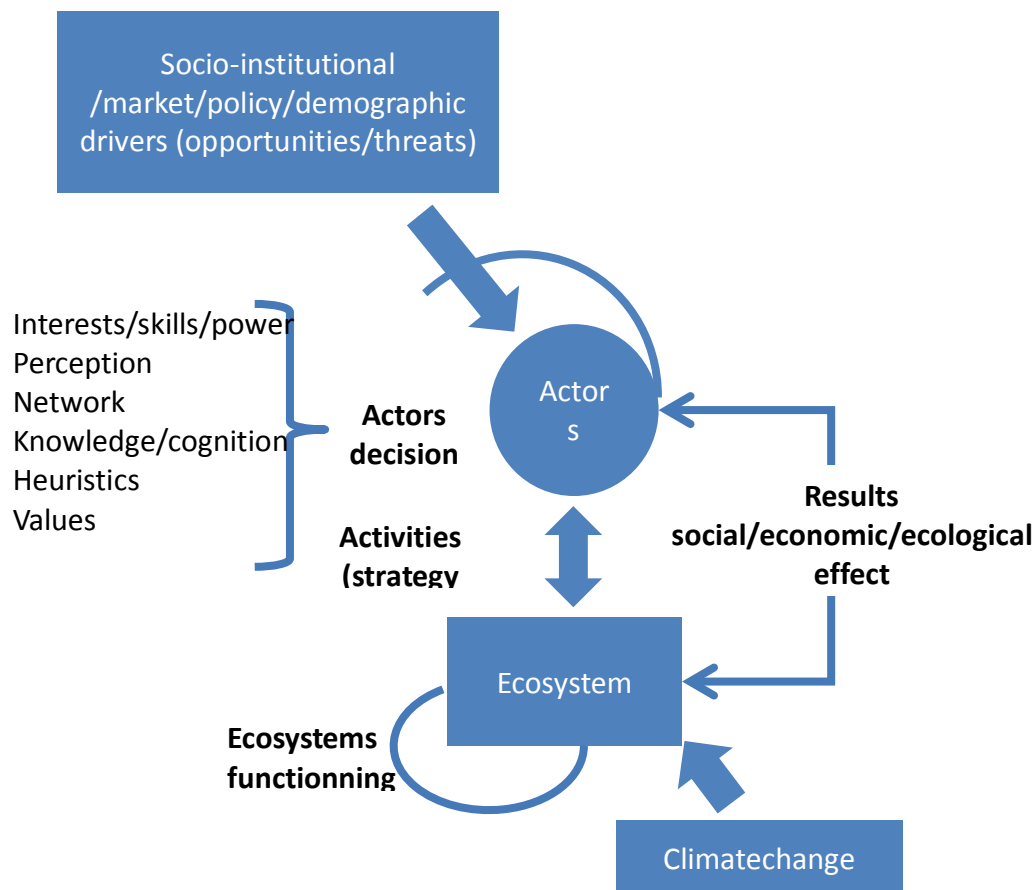


Figure 9. Visualization of the actor-resources centered socio-ecological interactions (SEI diagram)¹⁸

Comparing both diagrams, one notices many similarities and some differences:

In both diagrams, one sees the intimate relationship between interests, knowledge, perceptions, and decision-making on the use and management of natural resources. The SEI diagram puts the actors and resources (ecosystem) in the center. In the learning diagram, the development of shared knowledge from different points of view and sources is at the center of the set of variables.

In the two graphs, the broader context of decision making and learning is taken into consideration. Climate change is part of the context for decision-making and actions and an increasing threat, while in certain occasions and for certain groups it may be an opportunity.

Inside the SEI diagram the contextual factors are seen as drivers, while in the learning flow chart, and according to the idea of human agency (Long and other authors) aspirations and interests are seen as the main drivers for joint action and decision making.

In both diagrams, a key word is *practices*, the action and intervention on ecosystems (of various natural and productive resources at different scales). In both charts, the desired outcomes are the result of action undertaken (conservation and restoration), such as economy, welfare, access to water in adequate quantity and quality, and safety for farmers and communities.

¹⁸ In the workshops this was used to present the PARDI (Problems, Actors, Resources, Dynamics) framework.

In this respect it is necessary to distinguish between good and bad practices, as shown in figure 10 because this logically affects the results of the intervention. Good practices are to be conserved and increased; bad practices must be corrected, which may require incentives and alternatives along with sanctions. It requires considerable judgment and high quality communication with those making the decisions and actions. Good practices are also a crucial outcome of change in the planning phase (work package 4) and the project as a whole as stated in the project's theory of change: ***“producers and vendors of ecosystem services implement good practices that increase landscape hydrological services”***.

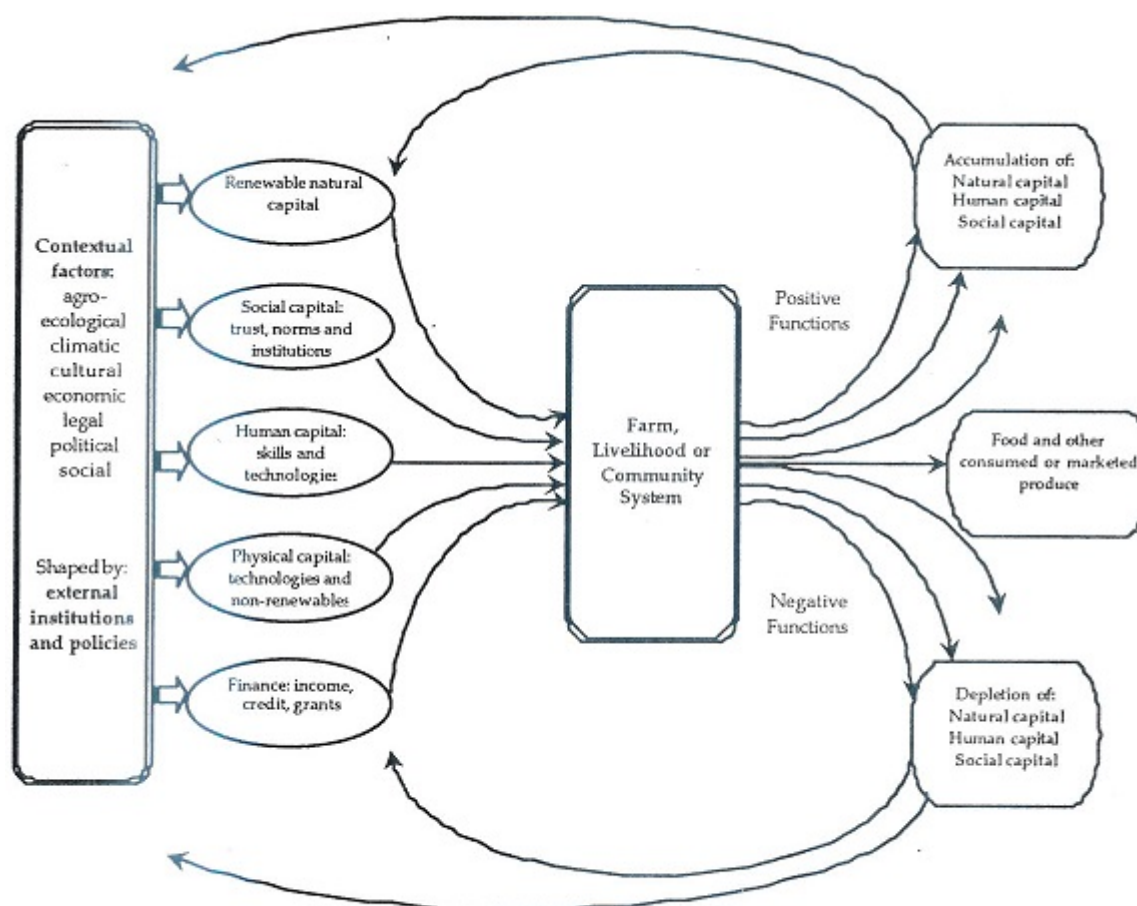


Figure 1. Assets-based model of agricultural systems

Figure 10. Feedback of the effect of good or bad practices on capitals and livelihoods. Diagram borrowed from Jules Pretty (1995)

In this diagram one sees that good practices are the ones which tend to secure or improve the livelihoods and conserve or strengthen the capital stock, while bad practices have the opposite effect.

The action results must feed the learning and decision-making. Therefore it is crucial to reflect critically in the learning cycle, on the actions carried out and their effects.

A distinction is to be made between actions, decision-making, learning at the farm level and at the watershed or landscape level. The latter requires shared understanding, collective action, a common vision, agreements, resolving conflicts of interest, and needs a larger timeframe. Interventions at various scales must be synchronized to generate the desired impact. Neither diagram displays the relationship between different types

of actors and decision-making at various scales, so we need another way to display this. This was done through the socio-institutional mapping (task2.3) whose visualization, learning and findings were incorporated in Deliverable 2.4. This mapping and stakeholder analysis put into practice what the literature also suggests: triangulate a) collaborative management of natural resource management, b) information sharing networks and c) create conditions for effective governance of a problem in a community or territory, between actors and scales (Crone et al 2010, Vignola et al 2013).

III Process and outcomes of joint learning and knowledge development in EcoAdapt

In this chapter we sum up the accumulated experiences and learning in EcoAdapt, from the beginning of the project to date (mid-2013): the initial workshop held in Concepcion, Bolivia, in May of 2012; the baseline studies to fill knowledge gaps (work package 2) and provide the groundwork for the scenario and planning phases (work packages 3 and 4); the validation workshops with the local actors in the three sites, November 2012 (the so called mini workshops) to discuss the results of the information collection so far, and; the synthesis workshops in April of 2013 between the MF teams and project investigators to measure the progress in the diagnosis phase and to lay down the foundation for the next phases, with the formation of committed change agents groups being one of the central tasks

The activities by these agents of change, recently organized in multi actor platforms, and the awareness and training events, planned in follow up of the workshops, are in full implementation and are referred to at the end of this chapter.

Mutual learning during the knowledge exchange workshop in Concepcion.

In this paragraph, we briefly address some procedures and results of the Concepcion workshop that have been widely reported already in the workshop's minutes (Deliverable 1.1).

Although the first kick off EcoAdapt meeting with representatives of the three Model Forests was in February 2012, the knowledge sharing process really took off during the first workshop in May 2012 in Concepcion. It was attended by the EcoAdapt project partners, which later participated in processes, methods and results of the diagnostic phase. It should be added that the first knowledge exchange workshop targeted project participants, not local actors yet, to ensure a shared understanding among project partners before activities in the project sites took off¹⁹.

A wide range of topics and methodologies were addressed during this workshop: Firstly the existing knowledge about the reality and problems of the three territories was captured and mapped. It turned out that the Jujuy MF team possessed more knowledge about water and watershed issues because they already had worked in this subject matter, while others were just entering into this problem area and had more experience in other issues (such as land use planning and processing of non-timber forest products). With regards to climate change, the level of insight was similar among all model forest teams. They were more familiar with

¹⁹Originally it was foreseen in the DoW to involve the agents of change already in the start off workshop for knowledge exchange, but the MF teams preferred to first become familiar with the needed concepts and methods and tools for information gathering themselves before identifying and involving the agents of change, which took place in a systematic and concentrated way, after the mini workshops of November 2012 and around the synthesis workshops of April 2013.

anthropogenic causes of environmental problems, and stressed their interaction with the climate change phenomena.

It was stated on the basis of hard facts that too much environmental legislation is not duly implemented and that there is a need to improve the environmental governance. There was a common feeling that in the future tensions may arise as a consequence of climate change and increasing water scarcity. (We take this crucial issue up again in the last chapter of the working paper.)

Having different experiences and opinions was a great opportunity for exchanging knowledge and stimulating debate. Project researchers explained key concepts, as well as approaches for mitigation and adaptation to climate change and how they relate to human factors. This helped to even out information among participants.

Later, the model forest teams constructed their visions as to where they wanted to go with the help of EcoAdapt, and which visions were synthesized with the Project's theory of change (figure 11).



Figure 11. Flipchart used in the Concepcion workshop to explain the theory of change in EcoAdapt

The different components and tasks of the diagnosis stage (fill the gaps in knowledge) were explained by the investigators as well as the methodology to be applied: mapping of stakeholders, interviews, case studies and the PARDI approach.

A broad variety of didactic methods were used, such as addressing problems and defining concepts through brainstorming (for instance, about the essence and methods of interactive learning and training); walking with a partner to share concerns and ideas; a forum theater to debate situations that one could come across in the project; a future visualization exercise, a knowledge fair to exchange information and negotiate mutual support, a trial about ecosystem services, and so on.

The knowledge fair was one of the most effective and stimulating means to get on the same page of knowledge formation and link knowledge demand and supply

There was a first, fruitful exercise to discover and identify common and different features between the three territories with respect to problems, opportunities, conflicts, legal frameworks and policies.

Knowledge construction and learning during the diagnosis phase

Based on the vision of EcoAdapt and each Model Forest, local teams elaborated their Terms of Reference (TOR) for research to orient the recollection and analysis of the required information.

The data collection methods and logistics were designed (mapping of actors, focus groups and semi structured interviews with local actor representatives) by mutual agreement. It was decided that institutional mapping should come first in order to know who to interview on other topics and start to raise awareness about issues.

To avoid inconvenience to people interviewed, one questionnaire was made encompassing the different project's diagnostics tasks (tasks 2.1 to 2.4). This made the interview longer but limited the number of interventions.

In the Chiquitano MF the planned interviews with communal leaders took the form of meetings with the whole community due to the insistence of the leaders, *"because we leaders have nothing to hide from the community"*. The planned visits to the water sources (springs, wells, streams), were not carried out due to lack of time and resources, but later they were performed at new more interactive encounters with the 15 local communities as a follow up feedback activity to the November 2012 mini workshop, with excellent results.

Different rhythms and allocation of human resources could be noticed between the three MFs. The Alto Malleco MF team solved its human resources constraints by hiring external consultants for the implementation and analysis of the results of the interviews. The number of interview questions was reduced to a manageable level.

Halfway through the collection of information, restitutions of the findings and methods took place in all three sites, including some complaints on logistics and the lack of smooth direction by researchers. To get on the same page and maintain a common direction and shared understanding of the progress and task to be carried out there were also monthly Skype meetings with all involved.

On the whole, the diagnosis phase was not an easy one, but it was a learning opportunity. It took quite some time to communicate and agree on content and procedures for the interviews, including the complex organization of the information through the four tasks, each one with its leader (in spite of the fact that the four tasks and themes were linked one with the other: learning; decision-making; social and institutional relations), which led to a lot of questions, and some delay in data analysis and triangulation. It was therefore agreed upon to postpone the research on socio-ecological dynamics until 2013.

On the issue of climate change, there were many different opinions expressed in the interviews, in which nevertheless one can also discover many common elements (see below). As for climate adaptation measures and responses, more attention should have been paid in systematizing some relevant traditional knowledge and practices in climate risk management by farmers and communities such as moist retention and other soil and water conservation measures, micro climate creation, modifications in the production cycle, management of pastures and animal husbandry²⁰.

In retrospect, the applied methodology somehow missed exploring the linkage with other projects and experiences developed in the three MF. Nevertheless, these experiences have now been incorporated in the project strategy.

²⁰For instance, in the summer the Mapuche communities and colonies of settlers in one of the Alto Malleco MF Communes, Lonquimay move their cattle to the Andean highlands for grazing, which is a traditional practice of climate risk management to secure the forage of their animals.

A limiting factor was the time pressure. EcoAdapt is not the only project for each of the local counterparts so there must be a tradeoff. It must be seen how other activities of the organizations can complement EcoAdapt activities so that competition for scarce time and staff resources is avoided, and all areas of action in a MF advance in a synergistic way.

Building cooperation among the project partners is a proven strength of EcoAdapt, but this has a price. Transaction costs are to be paid and trade off to be diminished. With so many different partners, **we also had to learn how to cooperate** and develop a common vision and language, a road to walk together, and to walk the talk. There are fruitful encounters and, sometimes, stressful situations. Trust, chemistry, mutual appreciation, common language and understanding are essential ingredients of building fruitful cooperation. The co-construction of knowledge in work packages 2.1 and 2 facilitated these ingredients, but joint learning can be slow and tedious sometimes. **However, in the end it is a cost effective investment. Not investing in it is more costly because it hampers achieving the desired change.**

Learning during the validation mini workshops of November 2012.

Planning, implementation and systematization

In September an IUFRO consultant traveled to the three territories to plan face to face with local teams and researchers, a series of mini-workshops to discuss and validate the data collected.

The central aim of the workshops was to share, validate and enrich the knowledge generated in the diagnostic phase and to lay a foundation for the next phases. In the workshop guide, the central systematization axis was: *the creation of shared knowledge as a basis for developing joint actions in line with the vision of Model Forests and EcoAdapt*. Expected results were:

1. Feedback given to information demands of local actors who participated in the diagnosis (people interviewed, stakeholders mapped).
2. The relevance, quality and usefulness of the information are validated and enriched with comments and contributions from the audience.
3. Information gaps are filled; inconsistencies clarified and needed additional information identified.
4. Common understanding and commitment are generated as a basis for developing future actions in line with the vision of EcoAdapt and the three Model Forests.
5. Change agents are identified who can take the lead in this process.
6. New perspectives are discovered on problems identified in the May 2012 workshop, as well as how to address them (entry points).

The central themes of the mini-workshops agreed upon, were:

- a. Climate Change
- b. Cooperation
- c. Governance

These issues were discussed in working groups, composed of representatives from various sectors with a variety of methods: posters with qualitative data tables and pie charts with quantitative data summaries, generating questions to encourage discussion, use of cards, among others. The variety of resources was

valuable for communication and the exchange of ideas, and allowed the expression of ideas from different perspectives and in different formats. The exchange of ideas took place orally and in written form, which allowed different means of participation.

Visual and oral information was more easily absorbed than written data. Jujuy MF used metaphors to express the idea of cooperation, such as the image of Mountains and Ships to express the idea of barriers to and opportunities for cooperation.

People feel freer to express their ideas when they are in their own group (such as farmers and indigenous people) but a mixed composition of sectors contributes to the exchange of thought and information beyond the group itself. It seems best to combine both approaches and organize first a discussion in each group as a trampoline to the discussion in a mixed group. This also helps prevent for only well-informed people to dominate in the debate.

Converting outcomes of the mini workshops into orientation of further field learning activities

An important lesson learned and outcome of the mini workshops was that in the course of a single workshop, one can pique interest and create curiosity but hardly reach a minimum level of understanding and commitment, especially if the issue is complex and new, so the best approach, which we adopted, is to generate curiosity and desire to continue the process through means which are both entertaining and instructive.

This led to a systematic planning and implementation of new and well focused field learning activities, channeled through the multi actor platforms to be formed and with very promising results (see some of the process and outcomes described below)

Procedure of mini-workshop observation and systematization

Precise guidelines were given for systematization and reporting. The results and lessons learned from the workshops were systematized in a joint effort by IUFRO researchers and local teams. There was a fluid exchange of ideas and information among IUFRO researchers assigned to the three sites, along with MF teams and CATIE researchers. Based on this cooperation, three summary documents were developed, as well as a second synthetic report from the three mini workshops. With these documents, we had in mind: 1) Make it easy to understand for those who were not in the workshops 2) discover common and different outcomes, 3) Develop an agenda post workshops, for the appropriation and subsequent dissemination of the information (validated within the communities).

Participant observation and self-reflection by local actors

The mini workshops offered a good opportunity to apply and validate the method of participant observation, introduced by two researchers from CIRAD, to observe and interpret attitudes, behaviors and relationships between individuals and groups (Jankowsky and Sabourin, 2013). The method implied a series of indicators and procedures applied by an outsider person, to observe the knowledge exchange and modes of debate: *Is the information clear? Do you agree with it? Does it bring something new? What are the topics that generate most discussion? Who are most outspoken? Who are close or distant in their way of thinking?* It included a phase of preparation, to define the indicators, and a debriefing phase structured around these indicators. The method was applied in all workshops, and the group dynamics and interaction between persons during the debate was mapped.

It was assessed afterwards that that this observational approach must be complemented by the “self reflective participation” implicit in action-research. This refers to the facilitation of a pro-active, direct involvement of local actors in the knowledge generation by sharing their own experience and knowledge with peers and interested parties (via storytelling, field days and exchange of experiences in situ) in order to arouse their interest and equalize capabilities. This sharpens their observation capacity and enriches their interpretation of their own reality with new points of view. Besides, self esteem is enhanced and skills for decision-making are improved. This latter approach involves valuing the tacit knowledge and integrates it with scientific knowledge, via inter-active methods such as testimonies, in-situ exchanges, designing and discussing of maps and transects, and representing local situations through theatre. This is less extractive and more proactive than interviewing, thus, consistent with the philosophy of co-creation of knowledge. It involves both the devolution of new external information amicably, and the systematization and documentation of own experiences. One illustration of this: in the Alto Malleco MF training plan for 2013, talks about the Water Code will be given, in combination with field visits and case studies to detect the ways and means of regularization of water rights. Similar developments in the field learning activities took place in other territories and will be related and analyzed below²¹.

Process, findings and learning from the mini-workshops according to the different sites

Chiquitano MF

There were some flaws in the implementation of the November 2012 mini-workshop, which affected the achievement of the expected results, but which were subsequently corrected. The original well thought idea was to organize the dissemination (and discussion) of information in two steps, 1) organize firstly a workshop with leaders of the 15 communities, providing that they would then inform their bases and 2) then organize a workshop with all the actors of the Zapocó watershed. The mini-workshop with communities could not take place because of logistical problems (which is something to expect in remote areas), so that in the end it was decided to organize a one-day workshop in November 30, at Concepcion with a schedule for an entire day. Later it became clear that the place did not offer conditions for an all-day workshop, so that it was decided to shorten it to half a day. Due to the fact that planned activities (thoroughly designed) did not fit in half a day, they had to be shortened which affected the quality of implementation.

Twenty participants including five community leaders attended the workshop. There was only one representative of cattle ranchers despite the fact that this group is a key player to achieve better use of natural resources and the preservation or restoration of water resources (livestock occupy 80% of the Zapocó watershed). A tiny minority group of cattle ranchers is permeable to the concept of eco-farming; this approach is a good entry point for the preservation or restoration of forest and water resources.

Three groups were created: local authorities, municipalities and communities that addressed three themes: water, climate change and cooperation.

The FCBC²² team captured well the convergences and divergences among opinions and the conducts of different stakeholders. There was a total coincidence in recognizing the paramount importance of conservation and restoration of water resources, although this from different perspectives and interests: It turns out that urban groups and municipal authorities are interested in maintaining and restoring the dam that supplies water to the urban population, while the local communities are not interested in it because they have no benefit from the dam, experience lack of water in sufficient quantity and quality and the drinking water infrastructure

²¹ They are also extensively reported and systematized in Deliverable 1.2 on field learning activities.

²² FCBC, *Fundación para la Conservación del Bosque Chiquitano* (Foundation for the Conservation of the Chiquitano Model Forest) is the direct EcoAdapt project partner, linked with the Model Forest organization.

is in poor condition. Thus, bridges are to be built between different perspectives and interests to enable a real and shared watershed management approach. The communities themselves are dispersed and have relatively little contact with each other. Therefore, one of the first tasks is to shorten this distance by creating a common vision and platform where the different interests and perspectives can be shared and developed.

There was great interest among the workshop participants in discussing the *Plan de Ordenamiento Territorial Municipal de Concepcion*, POTM (Municipal Land Use Plan) elaborated by FCBC and adopted a year before, but there was little time to do so. In addition, the POTM information was not duly integrated yet into the diagnostic information of EcoAdapt, so there was a kind of competition for the limited time available, rather than synergy of topics and related activities.

The issue of climate change proved to be incipient and still poorly internalized, so it must be linked with already perceived problems, such as deforestation, drought and fires. A video on climate change was presented, but had little relation with the perceptions of climate change captured in the surveys (besides, the surveys were not yet analyzed and synthesized by then).

A crucial issue and nearly absent in the discussion, was the role of livestock in water issues and the watershed. The person who put this into discussion was a progressive cattle rancher and former mayor of Concepcion.

Still, the strengths and weaknesses of the event were well analyzed afterwards and assimilated as lessons learned to implement future events better, as was done in the synthesis workshop and a series of successful awareness activities with the population. Hence, the final outcome of the mini-workshop, in last analysis, was not that bad.

Jujuy MF

The attendance to the workshop was somewhat below the expectations. Especially the assistance by the governmental sector left something to be desired, given that this sector is a weak node in the network of actors in the territory in which the Model Forest operates.

In the overview of the event it was concluded that there is an overuse of the workshop as a means for debate and opinion formation. Therefore, in the next project phase, the methodology and didactics were to be enriched with instruments such as focus groups and field trips among other things, both of which effectively took place (see below).

Among participants of the workshop, there was coincidence that the upper part of the watershed must be protected, but this awareness is to be converted into concrete commitment and action. It is a medium-term goal but one can start walking in that direction, recycling the already available information from a previous MF project on the state of affairs in the upper basin (PRECODEP- *Preservation, Knowledge, and Development of the Los Pericos-Manantiales region*).

Some ingredients to create a basin authority were stressed: 1) Building trust among actors to improve collaboration, 2) The formal authority must also have sound technical skills.

It is not yet clear though who should take the lead in the group of actors and Water Authority. There was a motion that the Bureau for the Administration of the Dam should take the lead in the protection of the dam, water and soil around the dam, situated in the middle of the watershed, but a representative of the irrigation board of the tobacco planters questioned its technical capacity for that role. Formal and moral authority do not always coincide.

As to the topic of climate change, participants observed a manifest risk of flooding as an effect of conservation and management failures in the upper watershed (causing increased run-off due to lack of topsoil and moisture

retention in the ground) and changes in the climate such as greater rainfall in shorter periods of time. The risks of flooding and drought are two sides of the same coin, caused by conservation and management failures. Jujuy MF also expects potential effects on food security and profitability of agriculture due to climate variability, increased temperature, increased water scarcity, water competition and change in the agricultural cycle due to climate variations (delay in sowing and harvesting of crops).

Alto Malleco MF

The mini workshop was an extremely dynamic event with a large participation of about 40 people, all of them interested in water issues (Alto Malleco MF and local actors). There is not much experience on this topic in this territory, so that a lively but still somewhat hidden concern was made more manifest. The same is true about the emerging issue of climate change; curiosity was generated through the input of information and discussion in the working groups.

There was a comprehensive and precise reconstruction of the changes in water use over the past 30 years, including the production of electricity, changes in land use and production patterns; irrigation projects (for agriculture, cattle, fisheries, forestry) and rural projects to provide drinking water.

What generated most debate and coincidence of opinion was the problem of unequal access to water among different types of uses and users, illustrated by the case of the APR project (Rural Drinking Water) in the micro-basin of Rio Blanco. The village leader Luis Parra exposed this issue. The 200 families in the project that need 4 liters per second for enabling the water project, are frustrated because a single person has monopolized 1000 liters per second for a possible electrical dam project.

Many different opinions were expressed about the relationship between land uses and production methods, with conservation efforts at one side and water use at the other side. Another issue was the impact of agricultural activity on the water cycle, a fertile topic for further inquiry.

There was much interest in climate change because of the novelty of the subject, although climate change is still hard to visualize, because its manifestations and effects are less visible than in dry, arid areas. Discussion focused on initial evidence already captured and in anticipating what might happen in the immediate or further future in order to take timely and adequate action.

In the debate it came up that there are losers and winners of climate change. The gradual increase of temperature in cold areas will enable agriculture where this was not possible before, with consequences such as increased migration to the territory, expansion of irrigation projects, effects on drinking water availability, etc.

A great demand for more precise or wider information was expressed during the workshop, demand being satisfied through new follow up field learning activities.

Learning and discussion outcomes: convergence and divergence of understanding of key topics among local actors at the mini-workshops in the three sites

About climate change

Views on climate change were mostly related to already visible and felt problems, such as more droughts, fires, floods, the late arrival of the rain for crops, more precipitation in less time. Similar concerns were expressed in the other two workshops. The views were based on direct observation or acquired by other means of information (television, radio, newspaper, training events) or a mix of both.

There is a widely shared feeling among the three territories (Model Forests) that the weather has become more erratic and unpredictable, making it more difficult to plan production based on past experiences and knowledge. In other words, the risks have increased and the livelihoods of farming families have become less secure.

There was coincidence that climate change exacerbates the problems originated in anthropogenic nature. In the Concepcion workshop, climate change was mostly related with the increased occurrence and frequency of drought, wind and fire. Fires are the events that most mobilize government institutions, producers and communities and which is a good basis for improved joint action²³.

In Alto Malleco MF, people imagine the consequences of climate change with a view into the more distant future, mainly because water scarcity due to climate change is not very visible or felt yet. During the group discussion, the most emphasis was put on land use change, increased demand of water for more uses, as well as lack of equity in the access to water, and local influence in policy making (called “legal stress”). Alto Malleco MF was the one to coin the words: *winners and losers from climate change*.

In general, there was more talk on steps to be taken in the future, than on what was already being done. There was also little discussion on traditional strategies of farmers and communities to manage risks of climatic events in the interest of food security, which was also a weak spot in the interviews. It is worthwhile to acknowledge and capitalize more on this traditional knowledge and practice, as recommended by the literature (see conceptual framework). For instance, as it was mentioned before, in the Alto Malleco commune of Lonquimay, the Mapuche communities move their cattle in the summer to the Andean highlands for grazing, which is a traditional practice to secure the forage of their animals, and an expression of climate risk management²⁴.

With respect to the sources of understanding, representatives from the farmers communities based their opinions mostly on direct observations, while representatives from urban settings and institutions, based their perceptions rather on what they had read and heard in the media and what they learned in training events²⁵.

Generally, there is a need to reflect more thoroughly on the best didactics and tactics to put climate change into discussion, given that climate change is a complex issue. It seems best to start with what people already know and perceive, and then take it further to what they want to understand better and deeper; start with concrete facts, then move to the abstract aspects; go from visible to less visible matters; teach on the basis of experience and decision-making, although expanding horizons and adding new evidence taken from science. The known and unknown, past, present and future can be linked in this way and makes it feasible to combine tacit traditional knowledge with scientific knowledge to reduce vulnerability and increase the resilience of people and resources (agro-ecosystems). This idea will be taken up further in the next section: *Analysis and synthesis*.

²³ In April 2013, there was a well attended activity in Santa Cruz around the implementation of a Defense Platform against Wildfires (Source: FCBC bulletin)

²⁴ In the discussion on climate change it is too often forgotten that climate risk management is not a new need and phenomenon, but a very old and well established practice and knowledge of farmers and communities to ensure their livelihoods through a varied repertoire of technologies and previsions.

²⁵ In Concepcion, the urban population based their perception partly on their experiences in the rural area, since most of them have houses in the countryside and have livelihoods from farming activities. Some *campesino* leaders with access to information reported perceptions based on external sources.

About cooperation and governance

It was recognized in the various debates that weak governance is a critical factor and obstacle to implement effective water protection and restoration measures and climate change adaptation.

Both in the Perico-Manantiales watershed of the Jujuy MF and in the Zapoco watershed in Concepcion, the legislation (provincial and municipal) prescribes the protection of the area around the dam, but in both cases the norm is not implemented due, among other reasons, to a lack of monitoring and follow up, lack of leadership, and support by civil society. Really, a big challenge is how to improve governance and effective implementation of environmental regulations!

According to the Jujuy MF and FCBC teams, the conservation of the water dams (in Jujuy and Concepción) depends greatly on the capacity of watershed management in order to restore the environmental system, but more thought must be given to this idea to put it into practice.

In Concepcion the idea surged of creating a watershed platform to ensure the water production and conservation in the Zapocó watershed. To support such a platform, different sectors of the local population as well as local institutions must back the idea. A bridge must be built between policy makers and the different territorial actors to create shared understanding, and the communication gap between farmers and livestock owners and between rural and urban groups must be overcome or diminished.

In the Jujuy MF workshop, all regional actors coincided that the problems in the middle and lower part of the watershed, are largely generated in the upper part and action needs to be taken. One weakness is the low population density in the upper part and the lack of communication between the 30 families living there (plus one large landowner) and the 100,000 families in the middle and lower basin. With regard to resolving the problems of the 'Los Diques' region, it is not clear yet which agency has sufficient authority and ability to take the lead. Political dynamics and jealousy must be reduced and confidence and chemistry increased, particularly in the state sector.

In the Alto Malleco MF, there was full agreement on the inequitable distribution rights of water use. The Communes of Curautin and Lonquimay are located in the upper parts of two major rivers, Curautin and Bio-Bio respectively. There is a sense of inequity that much of the water generated goes to large irrigation projects and hydroelectric plants in the middle part of the basin, while the populations in the upper part have less priority over water use, particularly groups of settlers and Mapuches indigenous communities. It is not fair and effective to demand to the local population water conservation efforts, without proper compensation for this effort and without recognizing their due share in the water rights.

None of the laws in the three countries (Argentina, Bolivia and Chile), give higher priority to drinking water use than other water uses. At least, in the local practice this cannot be noticed.

On the relationship between water, forest, land use and productive activities

On this issue, there were many different opinions and assumptions that need more thorough investigation e.g. socio-ecological dynamics.

In all three sites, the common way of thinking was: if more reforestation takes places, then an increased water supply will follow. How true is this? It remains to be seen and validated.

In conclusion

1. The mini-workshops offered an excellent occasion to measure (six months after the start up workshop in Concepcion) the progress made in capturing the knowledge, views and interests of the local actors around the central topics of the EcoAdapt project with the applied methodology, and to orient further

steps to be taken in the widening and deepening of knowledge, skills and tools among the local actors (and the teams and group of investigators themselves)

2. Valuable information and evidence was exchanged, knowledge gaps filled, remaining gaps and unknowns identified, demand received for more precise information according to perceived learning and action needs, level of interest and commitment captured, effectiveness of methods evaluated.
3. This all formed a good basis to develop and implement later well-focused training sessions on content and method. (see below)
4. Observation of the degree of interest and participation among the different persons and representatives of the different social groups and agencies in the workshops gave a first input for the identification of the change agents in the three sites.
5. It also gave input to scenarios and actions, because of the direct functional relationship between the results of the mini workshops and remaining activities such as a) the analysis of the legal framework and policies for decision-making, b) the activities of task 2.4 and c) the planning of work packages 3 and 4.

This all took more concrete shape in the following synthesis workshops.

Synthesis Workshops of April 2013

The three synthesis workshops were a new occasion to share knowledge and identify the focus of the next phase, as well as refine and validate the proposed methodology for scenario development and adaptation planning that the researchers had developed. It was also intended to encourage cross learning between model forests (with the participation of a representative from each MF) and engage agents of change/key players in the adaptation planning process.

The synthesis workshops were a bridge between the diagnostics (work package 2) and the development of scenarios and instances for intervention in the territory (work packages 3 and 4). Findings synthesized in three reports (Deliverable 2.4) were discussed, including entry points, barriers to overcome, opportunities to grasp, creation of panels and scenarios, which procedures were explained in detail during the workshops and revised in the first meetings with change agents of the three territories.

For adaptation planning a methodology was proposed, building heavily on "*Structured Decision Analysis*" from Keeney (see the '*Why do we learn?*' section in the conceptual framework of this report) which involves a sequence of five steps:

- 1) Analysis of the context of the decisions to be taken and the time horizon of these decisions and actions: When? What? How?
- 2) Objectives to be defined from the questions: *What do we want to change? What do we not want to change? What are the barriers and opportunities for this?*
- 3) Discussion of scenarios, alternatives and means to achieve the objectives
- 4) Consequences and evaluation of the alternatives (costs, benefits, effectiveness, equity)
- 5) Selection of the alternative (decision) to put together an adaptation plan

The methodology takes into account the uniqueness of each site. It consists of forming two working groups: 1) one "scenario team" are technicians (composed of researchers from scientific partner institutions and civil

society partners who will bridge the interaction with local actors) and 2) another group called “scenario panel” made up of agents of change and stakeholders.

Relation with the Socio-ecological analysis (task 2.4)

In the synthesis workshops, the methodology for socio-ecological analysis (i.e. so-called PARDI) was further explained and made more operational.

The P (Problem) of PARDI was jointly defined in each of the synthesis workshops, with quite similar outcomes, which helped to focus the project vision and aims in a comprehensive, operational and understandable way.

Chiquitania / Zapocó watershed:

“How to ensure the quality and availability of water for human consumption and production in the short and long term? This in a context of institutional weakness in water management, expansion of agricultural activity and population pressure, whereas dry periods are becoming longer and more intense”

Jujuy / Perico river basin

How to manage water and related natural resources? This in order to achieve current and future availability (in quality and quantity), equally for different uses (avoiding conflicts) in equilibrium with the environment and local development as well as to minimize the risk of damage and loss from extreme events (people, economic activities, infrastructure) in a context of increased climate variability and uncertainty (shortage, surplus, seasonal change and overlapping laws, institutional disarticulation and “lack of awareness” at the Perico river basin? (With differentiated sub-problems in upper, middle and lower watershed).

Alto Malleco / communes Lonquimay and Caracautin:

How to ensure water availability for local development in the short and medium term? This in a context of increased demand for resources, decreased precipitation of water and snow, as well as restrictive legislation for uses and accesses to water.

The Alto Malleco MF converted this problem into the central issue and objective of EcoAdapt in its territory, in order to focus more the team's original vision and to make it easier to join efforts and activities.

Identification and organization of the agents of change

The synthesis workshops have been an excellent opportunity to put into practice the concept and strategy of agents of change. It is worth remembering the definition and attributes required for the recognition of an agent of change as understood by EcoAdapt:

- Be proactive and thoughtful
- Be fully inserted in the own environment
- Be able to mobilize the own group
- Be linked with key stakeholders of the territory
- Be articulator of world, knowledge and visions
- Have time and commitment.

With this frame of reference, one has begun to tentatively identify and select appropriate candidates from the mini workshops and start forming multi actor platforms called panels and hybrid forums in the project language. Meetings with potential agents of change were organized during the synthesis workshop in each site.

In Concepcion (Chiquitano MF) potential change agent candidates were already approached by the FCBC team before the synthesis workshop, which resulted in a dynamic collateral meeting with a very diverse group. They proclaimed themselves as a *Grupo Impulsor* (Driving group) which expresses well the purpose of the group, and is in line with the project strategy. It was a lucky marriage between an endogenous wish and a project induced strategy.

In the other two sites, the process was somewhat slower. There was some trial and error to find the thread between vision and strategy of the project, scenarios, panels, hybrid forums (and other project terminology) and the formation and operation of the agents of change. Since then, the process has begun to take direction, shape, and pace (see next section).

This is another important outcome and learning point: **the rhythms and patterns of change vary according to specific territorial conditions and the dynamics go up and down, but the three Model Forests act roughly in the same direction and on a similar path, which enables the comparison among territories and an overall project impact. Or to put it in another way: the more actions and tactics adapted to the varying local needs and opportunities to realize the project vision and strategy, the better the chance that EcoAdapt will reach its goals.**

Fresh and purposeful learning after the mini and synthesis workshops

In this section we analyze and synthesize what was learned in 1) the consolidation and analysis of diagnostics information, 2) the focus groups with agents of change, 3) the awareness raising and training events planned after the mini workshops. This is an activity in full implementation, so that by mid-2013, we can just observe some first indicators and trends, to see if we are on the right track.

Chiquitano MF

As mentioned in section V 3, there was a delay in the analysis and devolution of the information collected in the diagnostics phase. This was later fully compensated with a comprehensive report of 300 pages in which findings and reflections of the four diagnostic tasks were integrated in a logical sequence of chapters and topics: 1) the vision and objectives of the project, and its scope as to the prioritized Zapocó watershed; 2) the work packages, project strategy, context and history of the zone 3), climate variability over the last 30 years and the findings on knowledge and perceptions of climate change; 4) a chapter on decision-making by different groups and government agencies considering also the legal framework of the country, 5) mapping of actors and socio-institutional relations among actors and in relation to the socio ecological system in Zapocó; the consequences of all this for initial action.

The chapter about perspectives and responses to climate change phenomena summarized not only the answers of those interviewed, but also used other sources of information, such as findings from a collateral project: "***The climate changes, do you change also?***". This project was implemented by the FCBC and focused on traditional practices to be rescued in order to stimulate management and adaptation practices to climate change in the Chiquitania region. Additionally, good use was made of news reports on climate events, their effects and the reaction to it by the population and institutions.

A common adaptation strategy to climate change in the communities is modifying the agricultural calendar, such as delaying the land preparation by two months compared to past practices. Before the previous slash and burn activities took place in the months of August-September, now they occur in October-November,

respectively. There is also a beginning trend to diversify the food production to reduce the risk of food loss and scarcity.

It was concluded that there are no significant extreme events that led to drastic lifestyle changes in the Zapocó basin. Extreme events occurred in isolation, causing a subtle and gradual change in the lifestyle of the communities.

As to the work methodology of the workshops and field learning activities, weaknesses discovered and analyzed were successfully overcome by applying a systematic and differentiated approach to different actors and sectors of the territory. Thus, in recent meetings with the 15 communities, the mini workshop information was returned in a friendly way for proper learning. Besides, interactive methods were used such as visits to water sources and transects and exchanges, in order to refine the diagnosis and promote a valorization of their own experiences. The joint observation and discussion of the state of affairs of the communal drinking water infrastructure and management aroused the consciousness and interest for improvement by leaders and community, and gave the newly formed multi actor platform precise information on action to be taken within an incipient watershed management view, and last but not least, strengthened the relation and cooperation between rural and urban actors.

There are also plans to get in touch with a circle of eco-livestock producers seeking a transition to a more environmental friendly animal husbandry management in the region through exchanges, experiments and sharing their results. This is a good entry point to include cattle ranchers into the EcoAdapt project and taking advantage of the presence in Concepcion, of Alta Vista, the FCBC experimental farm.

Inclusion of cattle ranchers is a must in watershed management and a main challenge for the platform and FCBC. Some new opportunities are opening up with the recent Law 337 which pardons illegal deforestation. The 337 Law states that illegal forest clearing that has occurred in areas designated by law as areas specifically only for forest management, need to be reforested. The area to be reforested is over 200 thousand ha in the Santa Cruz department and mostly cattle ranchers are affected. This opens up opportunities to work with them in the creation of ecological corridors and prioritize reforestation areas that are important in the hydrology of the watershed.

Central to the whole strategy is the place and role of the newly formed driving group that acts as a bridge between the project team and the groups they represent and which shows in short time a very dynamic development.

The central idea is to involve and bring together a variety of sectors slowly but surely in a kind of a watershed committee or other form of governance. This will hopefully promote protecting and restoring of the water resources in quality and quantity. Clarity, patience and ability are needed to reach that point.

To obtain more empirical evidence on the critical factors for concerted action and governance, other experiences from FCBC will be systematized such as the Concepcion Municipal Copal Reserve, and the experience gained with the production and marketing of non-timber products of copal (natural medicine) and almonds.

Since 2013, the progress and scope of these ongoing activities are reported monthly in a pleasant and concise Bulletin from FCBC.

Alto Malleco MF

In the 2012 November workshop, demands rose for more information on certain hot topics, which highlighted the need to continue with discussions and organize the MF for this. Thus, at the first meeting with key people groups in Curacautin and Lonquimay Communes (in April 2013), the November 2012 workshop was taken up again, and the demands were converted into a precise training plan.

This plan has several components: water and land management related information will be written in an easy way to be better assimilated by the general public; talks will be given on topics of climate change and water legislation; field days will be organized to exchange experiences; the information and field visits combined, will give guidance on how to regulate water use rights and analyze conditions for its success; storytelling and testimonies will be applied.

This plan is a hybrid of activities to capture information and experiences of local actors, generate a human and social capital of knowledge, and stimulate commitments and forms of cooperation and joint action.

Groups of agents of change were formed in the municipalities of Lonquimay and Caracautin respectively. These groups will play a key role in forging capabilities and commitments, as they are a node within their social group or institution, and a bridge between project team members and the sectors they represent. This corresponds to the idea of a learning network and the profile of agents of change, which integrate worlds, groups, ideas and visions.

The November 2012 workshop also acted as a trigger to find a solution to the problem that has drawn on for years: a proposed drinking water project for a community in the micro watershed of Rio Blanco, which was approved but stagnated for years for not having the right to 4 liters of water needed to make the project feasible. This case showed the problem of legal stress and consequent stagnation of local development and welfare in the MF region in Chile.

Different activities were combined to find a solution to this problem: study of policy and legal framework and its implication for action at the ground; two case studies of communities of Mapuche and settlers (the case of Rio Blanco and Luis Parra); observation in situ; negotiation and mediation with the person who supposedly had the water use right; the local MF manager mediated and achieved in principle an agreement to obtain the needed amount of water for the drinking water project. This activity had no happy end yet as to acquiring the needed 4 liters of water, because in the end it resulted that the person negotiated with did not possess the water use right he was willing to cede. This obliges the group and the MF team to seek the real owner or find other ways and means to obtain the water amount needed, which is done at the moment in an insistent manner.

The work in the Chilean MF shows that the matter of water use rights is a kind of legal labyrinth and that one has to discover the way in this labyrinth through perseverant and guided exploration.

Some other preliminary outcomes and lessons learned can also be drawn from this instructive case:

1. There is no need to wait until the legal framework changes to start acting. First concrete actions can be stepping and building stones to promote wider changes. In this process, experiences are accumulated and forces for advocacy created. It also creates good conditions to initiate a well-informed policy debate.
2. Within the limiting legal framework there are aspects that should be taken advantage of, for example, that water users around an aquifer or watershed can be organized for joint use and management (see Deliverable D2.4 *Analysis of Socio-Institutional Relations*).

3. The case shows that EcoAdapt is properly situated at the interface of science, society and policy making, and can provide informed guidelines for concrete changes in reality, according to felt local needs overcoming (or shrinking) barriers and seizing opportunities.

Jujuy MF

During the synthesis workshop in April 2013, a series of interviews were held with persons representing various social groups and institutions to grasp their level of interest and commitment to participate in a support group for EcoAdapt process. Based on this approach and lessons learned, an Institutional Forum (“mesa”) was founded with the representation from a variety of local actors to gradually develop a climate change adaptation plan.

To capture their common interest, there was a vote to choose topics for discussion and action. The theme of *anthropogenic contribution to climate change effects on local development* received the most votes, which expressed an interest in obtaining better understanding and doing something concrete in matters within local control, and become more pro-active and resilient against climate change events in accordance with the idea of an climate change adaptation plan to be made soon.

With this in mind, a joint interpretation of the problems around the ‘Los Diques’ water dam and reservoir was carried out in the month of August. The guiding ideas were to observe and interpret the problems together by walking through the scene, to stimulate joint teaching and learning, to generate a common vision, to reduce jealousy, to increase confidence and chemistry, to generate an appropriate learning environment and to stimulate future commitments and actions.²⁶ The idea is to organize a similar tour in the spring of 2014, focused on the situation in the high part of the watershed, where many of the problems in the middle and lower part are generated.

The training objectives, content and methods and the refined and shared knowledge development are entirely in line with the TOR objectives formulated by the MF team for the diagnosis stage: addressing the problems at the ‘Los Diques’ region and of the watershed as a whole, as visualized in Figure 12.

²⁶It is noteworthy that in the mini workshop reflections of November 2012, some weaknesses were detected such as the overuse of the workshop methodology, where certain people tend to dominate and people do not listen enough to each other – a flaw which was overcome with this well conceived new field learning activity.

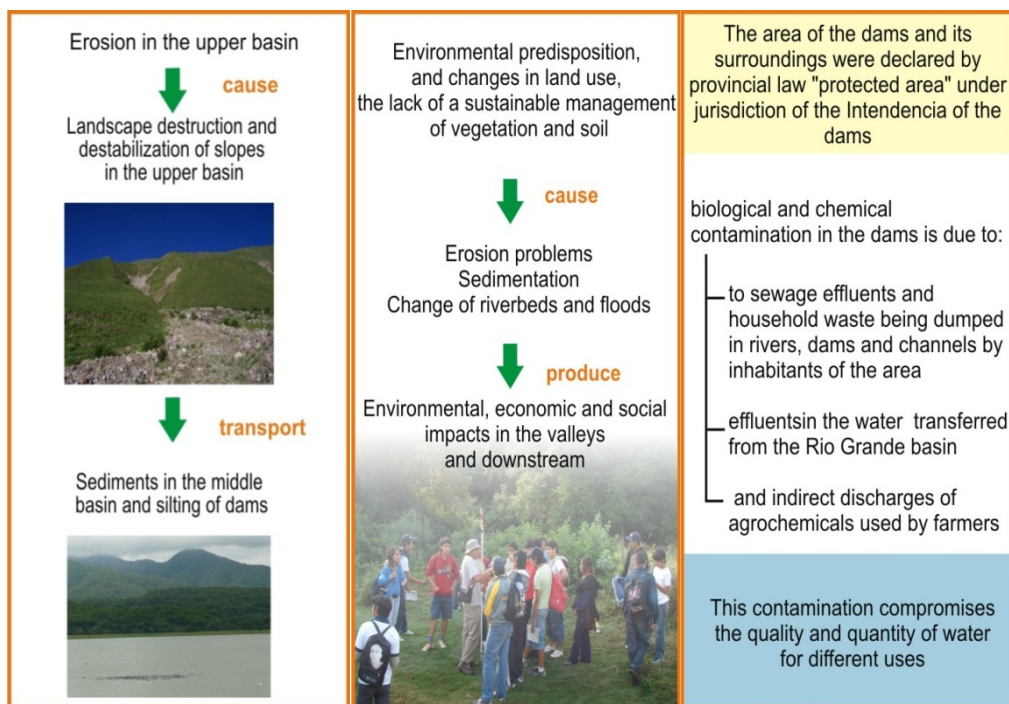


Figure 12. Visualization of the problems of the 'Rio Perico' watershed and 'Los Diques' region.

Common outcomes and lessons learned in the three Model Forests at the moment.

The activities and processes differ from territory to territory. These territories show quite obvious geographical and climatic differences, as well as in history, ecosystems and landscapes; modes of production and livelihoods; legal and political framework; local organization and institutions; culture and traditions. However, within these variations, common features can be found as it was discovered in the first workshop in May 2012 in Concepción Bolivia, and in later events. To date these common features can be perceived with greater precision, by incorporating also the vision and perspectives of the local actors and through the experience gained in the project so far:

1. Not only does the stress of climate change affects the territories, but also the legal stress about water and land use and access, which is an issue of fairness and legitimacy.
2. Other effects are caused by the methods of agriculture, forestry and production (polluting water) and the quality of management of natural resources in the basins, this being another area of analysis, learning and action.
3. Improving governance is a critical parameter and *a condition sine quanon* to change the state of things in the protection, conservation and restoration of water resources: too many environmental regulations are not duly implemented and have limited support in civil society. In some instances, they overlap and contradict each other. Incremental steps have to be made to lay the foundation for more effective governance. This all requires proper analysis and synthesis, and a regular exchange of information so that everyone will get on the same page of knowledge and commitment
4. Devolution of new information to local actors in a friendly manner must be combined with capturing and capitalizing on their own local experiences for mutual accommodation and integration, which can be duly achieved with an appropriate methodology, attitudes and behaviors for joint learning and create conditions of informed, concerted and effective action (attributes which were summed up in the forgoing conceptual framework, inferred from the literature and case studies, **whose relevance was fully validated in the EcoAdapt empirical experience.**

5. The role to play by the multi actor platforms is of most importance because it acts as a bridge between individuals, social groups and institutions they represent. **They start acting as central nodes to socialize and equalize information; enhance capacities; debate issues and action to be undertaken; articulate different competences, views and roles to enhance effectiveness in assigning scarce and precious resources. A critical and engaged mass of people is required to reach the project vision.**
6. To enable a smooth implementation of a complex project as EcoAdapt there must be increasing convergence and complementing of activities, tasks and products, which is doable. The results of the three tasks in the diagnosis phase already converged in the mini and later on in the synthesis workshops discussions. Now it must be ensured that the diagnostics results are properly understood by all agents of change (group drivers) panels and scenarios, training and awareness events. The instruments must be varied, but consistent, complementary and manageable. **Maximum transparency is an absolute must to make complex matters understandable and create a base for motivated, informed and concerted action.**
7. There is a growing conviction in the central management team and the local teams, of the importance to capitalize on other activities and experiences of the Model Forests along implementation of EcoAdapt activities, so that the latter give an added value to the former and the other way around. As a matter of fact, the three MF teams signed up for this in EcoAdapt: to diversify, deepen and widen their understanding and capacity to transform reality in the territory they are acting in, in close interaction with the local stakeholders.

IV Analysis and synthesis

In this chapter, we compare the learning generated in EcoAdapt so far with the conceptual framework and its corresponding flowchart in order to generate deepened understanding of the empirical facts; additionally, the conceptual framework will be validated and enriched with data collected and analyzed in the previous chapter: *Process and outcomes of joint learning and joint knowledge development.*

We briefly recall the main categories of the conceptual framework for learning visualized in the learning flowchart (figure 9). The numbers in bracket are used below to better understand where the analysis falls in this framework

Conceptual framework elements: [1] Project strategy; [2] Context for learning and decision making; [3] Stimulus; [4] Interactive learning methods; [5] Explicit/tacit knowledge integration; [6] Appropriate learning environment; [7] Problem understanding and decision making.

[1] Exchange and creation of knowledge is a core activity in the project that took off in the May 2012 workshop in Concepción (at that time only between teams of three BM and the researchers of the project). Knowledge is permanent, transversal and constantly evolving. It is, indeed, a wheel of learning in which knowledge is developed in a sequential, cyclical and repetitive manner, it is encouraged and pushed by the desire to change certain aspects of reality and in which process a variety of pieces of information and knowledge are assembled as in a puzzle. [5]

[2] We entered an uncharted territory²⁷ concerning water security issues. This expression does not refer so much to the biophysical and geographical aspects of a territory and the characteristics of its population, as well as to approaching a relatively new topic²⁸ for many members of the project. [1] ECOADAPT is really a learning project²⁹. In this journey, adaptive management and learning go hand in hand.

[1] The big challenge here is to generate knowledge and capacity building among researchers (CATIE, CIRAD, SEI, FLA, IUFRO) and three Model Forest teams, without detracting from the particular features of each territory and its people.

What are the driving forces for learning inside the project? :

[1,3] The vision of the project is the engine of learning to some degree, because if we coldly analyze the project, a distinction is to be made between the type and motivations of different actors in the process: during the initial workshop in Concepcion, we set into motion a process of knowing each other and interchanging knowledge, interest and visions within the overall project philosophy and strategy. [4] The knowledge sharing experience through a knowledge fair expressed the essence of exchange as it implied give and take, negotiate and agree for mutual benefit³⁰.

[2] However, within the same project, there are always different interests. Researchers and local MF teams need each other. There are encounters and sometimes, tensions. Moreover, in a given territory there are a large number and variety of actors with different relationships to natural resources, livelihoods, interests and visions regarding desired change operating. The art (more than a science) is how to accommodate and unite this variety of actors and interests in a common direction and along a shared path. There must be a shared sense of direction and an adjustment of the strategy according to the learning in the process. [3] It is essential to manage properly the interface between actors and parties in order to refrain them from 'playing on their own', without considering the work of others and the process as a whole. Jealousy must be avoided while still remaining assertive. [4][5][6]

[1] What does learning by assimilation and accommodation in the context of the project imply?

It means that new ideas and information must be inserted into what people and groups already know so that the information will be really absorbed (for instance inserting new information into fire management and overall climate risks and conservation practices already applied). It also entails discarding, if necessary, old ideas that do not match new information. Example: problematize the relationship between forests and water. There is a widespread view that the larger the forest, the more water production. It has to be seen under what conditions this applies, to what extent this is true or not, and what are the critical parameters for water retention, restoration and regulation of the water cycle and thus contribute to the desired and needed climate

²⁷ This term is a metaphor to express the need to explore all options and find the right path. It also shows the need to be daring and leave the "comfort zone".

²⁸ Jujuy MF had experience in watershed management, while the other two MF not so much. For the Chiquitano and Alto Malleco MF, the subject matter was relatively new, but they have more experience working with indigenous groups, forestry and the production of non-timber forest products.

²⁹ Projects that adapt their strategies along the way according to what they discover and learn tend to be more successful in the accomplishment of their vision and goals than more rigid projects. (Prins 2005).

³⁰ The methodology of exchanging knowledge through an information market place is good fun and effective, as observed in other projects that used the same methodology. It is a metaphor taken from the economic field and applied to social processes.

change adaptation. In this respect the science community can quite well inform the debate by making available existing information or generating new information.

[5] How to identify the role of the MF teams in the generation of knowledge? The teams are in the interface between scientific knowledge and tacit knowledge. They have a foot in both worlds (They do research and know the reality of the territory and its people) hence they are bridges as to the integration of knowledge. Local teams are bridges and interpreters of knowledge and reality³¹, and hence reflective practitioners. They are also fundamental in making the link with policy makers making in the region and stimulate political incidence by the local actors of civil society.

[1][3] With a view to move forward towards the vision of the project, we need to gradually integrate different perspectives and skills, thereby creating a common vision in order to promote concerted action³². All members should push the wagon in the same direction – a colloquial equivalent of critical mass and positive inertia relative to Newtonian physics.

[2] Thus, also the role of agents of change and their link to the sectors they represent have to be defined in that perspective. They are nodes in a network of contacts between project team and the groups and institutions the change agents represent or are linked to. As they become more informed and immersed, these change agents also become reflective practitioners and bridging actors. It is like a snowball that gets bigger and bigger while rolling.

[4][5] We need to disseminate information but also to collect knowledge from experiences of local actors, through testimonies, exchanges of experience, socio-dramas, talking maps³³ and other interactive methods.

[1] This is expressed in the idea of formation of panels and scenarios of change in Work Packages 3 and 4. In fact, the driving groups are the panels, and the design and evaluation of action alternatives has to do with the development of intervention scenarios.

[1][4][6] Different actors and types of knowledge (formation) come together, which shortens the distance between researchers and practitioners. It is about developing knowledge, skills, attitudes, behaviors, roles, relationships and mutual respect within an enabling project culture and learning environment. Thus, in the process of co-construction of knowledge, the quality of interaction is key. Criticism and appreciation should go together. It is an arduous process but perfectly feasible.

[4] As the project progresses, there will be a gradual transition from information extraction and transfer towards more interactive co-creation of knowledge and skills, as already noted in this transitional phase from diagnostics to scenarios and planning.

[5] There is also a need and possibility to systematize and analyze factors of success or failure of other MF experiences, besides of EcoAdapt. This widens the evidence basis and contributes to effective interventions.

³¹ IUFRO consultants are also part of this category because they are really interfaces between the local teams and practice and the central management and scientific dimension of the project.

³² Concerted action expresses the idea of a concert in which everybody plays his or her instrument in an artful manner and in which through the mastery and coordination by the conductor, a total product, beautiful music, is achieved. **But who in real life is the conductor?**

³³ 'Talking maps' is a common methodology applied in Latin America in which the participants draw a map of their community, which serves as a medium to generate a discussion about how reality is and how it should be. The map is product and medium at the same time

For instance in MF of Chiquitania, the case of protecting the Concepcion Municipal Copal Reserve and other non-timber products produced in this area.

What do we mean by good practice within the project?

[7] The concept of good practices is not limited to the production at the farm level, nor to a more friendly way of production, but implies also the strategies in conservation and restoration of forest resources and water at the basin or landscape level. It refers also to the approach and joint action as to common risks of fire, flood, drought and climate change itself, and not in the last place, requires improved conditions of governance, including the effective and equitable implementation of environmental regulations. In fact, there are too many environmental standards that lack a solid support from civil society. (See given examples above). Without substantial improvement in governance, it is difficult to obtain other desired changes in reality.

[2] With this regard, one needs to distinguish clearly between different levels of learning, decisions and actions according to the type of problems to be addressed, such as learning, decision-making and action at the (micro) watershed level. This latter is more demanding and requires a longer period to work only at the farm level. (see Figure 3)[2][7] The challenge is to know how to articulate different levels of intervention to obtain a greater impact. Action at the landscape level (watersheds, forests) has a greater chance of success if it is supported by environment friendly production activities in the farms and communities. **One must act at different scales simultaneously and articulate these interventions. Policies and Laws without roots in and support from civil society are not very effective, and action at the ground without legal and policy backing also has a limited impact.** Keywords about this are **articulation, interface and building bridges between actors, sectors and scales.**

[1] As EcoAdapt moves forward, action planning and feedback of results will be more and more important for learning and decision-making.

[7] The project and process are complex, thus we need to make them transparent, easy to understand and easy to manage. If not, people may feel overwhelmed and paralyzed by the complexity. The process of learning and teaching is as important as the content. **Problematic does not mean complicate, but rather to make a complex reality more easy to understand.**

[7] **This applies also to raising awareness on climate change.** People observe phenomena and feel the effect over their livelihoods (directly or indirectly). It is worthwhile to base teaching on what is felt and observed empirically already such as: extension of drought, fire, extreme short rains out of season, changes of dates for planting and harvesting, and then add to this knowledge, new information and evidence to make people become more knowledgeable, proactive and prepared. **It is the essence of increasing social resilience. In short, we must capitalize on experience and add value to it with new data that are still out of reach for many local actors.**

[7] **In this sense, we need to capitalize on practices and risk management responses. Adaptation to climate change involves reducing vulnerability and increasing resilience of both the persons and groups and the biophysical ecosystems.** Agronomic practices need to promote conservation of soil and water to prevent runoff and increase retention of soil moisture. This will reduce the occurrence of floods and drought. The FAO called this process **climate smart agriculture** and there is a growing emphasis on this. The new concept of **climate-smart territories**³⁴ is also starting to emerge

[7] The anthropogenic and climatic causes interact in the generation of risk. Therefore, in order to reduce the risk, both causes need to be considered and tackled. If done properly, vulnerability will decrease and resilience

³⁴ A congress is scheduled for September 2013 in CATIE, Costa Rica, precisely about this subject.

will increase. **Natural disasters are not always natural and the risks are a function of threat and degree of vulnerability, as it is shown in the well-known risk management equation: Risk = (Threat x Vulnerability)/governance and resilience.**

[7] The risk of harm by weather events depends on the vulnerability of individuals and groups to the type of threats they are exposed to. If they get organized, become well informed and behave pro-actively, they become less vulnerable and more resilient. To the extent that they manage, conserve or restore their productive and natural resources in their farm and micro watershed, they become also more resilient to climate change events. That is why this is called socio-ecological resilience, in the PARDI approach.

[2] On the other hand, many problems are not caused only by climate stress, but also by legal stress (Chile). **Therefore, it is necessary to create conditions of governance, and promote advocacy in the legal framework and policies, which is not only a matter of effectiveness but also of equity and legitimacy.** This is not achieved from day to night. In the meantime, it is feasible to take advantage of the positive aspects of the legal framework on water (the Water Code) and start negotiating improvements. This is one of the lessons learned from the project, such as in the case of the Luis Parra potable water association in the Alto Malleco MF.

[1] Improving governance is “*a conditio sine qua non*”, as well as a strategic objective to achieve the ultimate goal of EcoAdapt.

V From learning outcomes to inputs for action and strategy

In chapter V *process and outcomes of joint learning and knowledge development* we explained in an extensive and comprehensive way what knowledge and views were co-created by what means, and what remains to be filled more precisely. In the previous chapter this was analyzed and synthesized making the connection with the conceptual frame work flowchart. In this chapter, the reflected outcomes are converted in guidelines for action and strategy for the coming two years.³⁵

With the frame of reference of the project’s vision and theory of change in mind and the experiences accumulated, it becomes clearer what we need to do and learn more to advance towards the project vision:

Central aspects of the vision and strategy of the project are:

1. Conservation and restoration of watershed ecosystem services for climate change adaptation and local development
2. Innovation and improvement of water governance
3. Co-creation of knowledge, skills and will in that direction

Moving effectively towards the project vision requires constant reflection and refinement of the intervention strategy. Not only do we need **milestones** to measure progress, but also **building stones** and **stepping stones** to make real progress towards the project vision.

³⁵The information gathered and analyzed about processes, methods and results of learning activities will be used also for a reader friendly booklet for a broader public in Latin America.

So we have to ask ourselves what are the necessary conditions to effectively advance towards the project vision from the point of view of learning and informed and concerted decision making. Hereafter are some reflections that stem from the first phase of the project:

Transforming reality and overcoming counter forces requires the creation of a critical mass of informed and committed people. This requires shared knowledge and commitment; methods of joint learning; key persons acting as nodes and bridging actors in learning and action networks; the creation of multi actor platforms. We have put this into motion with some promising results, but the momentum should be maintained, the advances consolidated and new steps taken for qualitative progress.

The multi-actor platforms of agents of change and representatives of different sectors of the population, is a work in progress. They are potentially fundamental organizational and planning assets: they act as central nodes to socialize, democratize and equalize information; enhance capacities; debate issues and action to be undertaken; mediate conflicting views; articulate different competences and roles to enhance effectiveness and economy in assigning scarce and precious human, institutional and financial resources. This potential is materializing in a short time and with dynamic development, as it was shown in previous chapters. But the process is still very fresh and must mature; the platforms are broadly based, but also a bit amorphous and need structure. As a matter of fact they are a kind of mixture of the panels and hybrid forums that are planned for social validation of the decisions taken by the scenario panel. Continuous facilitation and monitoring by the MF teams is needed.

The joint learning and knowledge development does NOT stop after this year 2013, and enables more geared, specific and effective intervention channeled through the multi actor platform, and with the facilitation of the MF teams. As the project advances, action, learning and investigation (reflection) will get more and more intertwined and reinforce each other, as can be observed already. As a matter of fact local actors become more investigation motivated if this is action related.

The results of the investigation, learning, commitment and institutional development so far will be converted in the first semester of next year into inputs for robust and viable climate change plans and projects in the three territories, with a maximum project priority and an excellent opportunity to put everything in place and perspective.

Making a robust and viable climate adaptation plan implies reducing vulnerability, increasing resilience and building more solid governance conditions. But this must be made concrete and connect with what people already do, know and want to change, and in which process local development, social and ecological resilience change adaptation (risk reduction) go hand in hand.

The issues EcoAdapt deals with are quite complex, thus we need to make them transparent, easy to understand and easy to manage. If not, local actors will feel overwhelmed and paralyzed by the complexity. Therefore the didactics of learning and teaching are as important as the content. Problematic does not mean complicate, but to make a complex reality more easy to understand.

Learning encompasses all activities and EcoAdapt partners. All persons involved in the project, must learn and can teach something because no one owns the absolute truth and talents are always different. So we need to cultivate an appreciative culture and build on this diversity. It was proven in the experience so far that this is not just necessary but also quite feasible.

Besides, each one plays his or her role in the project within a common vision and language. It is just like a puzzle that shows a clear picture as soon as the different pieces are put together and every piece has got its place and meaning in the whole. This requires a helicopter view, which is a main quality and responsibility of the central management team, although other persons must also be able to look out of their box. It is an arduous but doable process.

As argued in the system theory, due to synergy and symbiosis, the whole is more than the sum of its parts, but this is only true as far as persons and groups push into the same direction and complement each other (arduous process but not an impossible mission). Otherwise, rather than added value, it could result in subtracted value. Furthermore, when costs exceed the benefits, a group tends to disintegrate. Also, free riding must be avoided, because it damages the will to cooperate.

A kind of social chemistry and physics is needed in order to consolidate the project vision; convert divergence into convergence; build on synergies; create a critical mass and a positive balance of social forces; turn negative inertia into positive inertia; catalyze and reactivate dynamic processes to transform reality.

100% clarity or 100% certainty is not required to start acting³⁶, because this would lead to paralysis. Clarity and certainty can also be achieved through acting, learning and readjusting at the same time, as shown by the literature and experience in adaptive management. In such circumstances, goals of change need to be clear, as well as objectives of learning and inquiry, if possible with working hypothesis and small-scale pilot actions which serve as a beacon that sheds light on the road ahead. This is the essence of adaptive management, the wheel of learning and action-research. This approach is even more necessary, if one enters into a new thematic territory, not yet well known and to be further explored and discovered.

Learning outcomes for strategy development, policy debate and political incidence

The gained experience is still short and limited, the project not being halfway yet. Still, some first preliminary inputs for strategic development, policy debate and policy making can be inferred already from the lessons learned so far, although in a cautious way:

The strategic importance of articulating actors and scales of intervention

Policies and laws without roots in and support from civil society are not effective, and action at the ground without legal and policy backing also has a very limited impact.

It is necessary and feasible to shorten the distance between state agencies and civil society, and involve policy makers through dialogues, meetings and multi-actor platforms.

The same is true as to promoting more articulation among the government entities themselves and with civil society organizations in order to make an optimal use of scarce human institutional and financial resources in environmental, climatic and development matters. Equally important is to enable articulation between spatial scales and levels of governance. This process starts taking place.

The EcoAdapt financial means are quite limited, although they already generated some promising results in enabling actor cooperation and articulation in the three territories with a shared vision, commitment and functional labor division. This also reduces the suboptimal use of money because of badly coordinated action or lack of complementarities.

The strategic and economic value of the formation of platforms of agents of change

Cooperation and articulation through institution building is of strategic importance on the road to territorial and community based management of environmental and climatic challenges. There are indications that there is good progress on this road and there is (more) clarity how to get there.

Economically, efforts invested in building multi-actor platforms and creating conditions for actor cooperation and articulation, are cost effective, because they create trust and chemistry, common language and vision, definition of roles and competences, functional division of labor and other ingredients for lowering transaction costs and trade off, and they increase the impact of scarce resources allocated, within the perspective of the EcoAdapt vision and objectives. Multi-actor platforms induced by the project also emerge from bottom up processes, hence they empower territorial actors and secure, to a certain extent, the incidence and long-term impacts of the process they facilitate.

Ways and means of articulating local development and climate change adaptation

An incremental and flexible approach must be applied to achieve the desired climate change adaptation for local development (the project name in Spanish, agreed upon with the local project partners). The relation between the aims of climate change adaptation and local development is not lineal but interactive³⁷. In tactical and practical terms, it seems that the main driving and mobilizing force for local concerted action is resolving immediate felt and shared needs of local development such as securing access to water, food, health and livelihoods. Hence, the climate change adaptation to climate change rather follows as a concomitant result of this initial action drive to be properly inserted into the action endeavors, which will be a central task in the overall climate change plan (and pilot action) to be elaborated in every Model Forest in 2014.

Scaling up initial local action to policy debate and incidence

When initiating concerted action around felt needs, people want to be successful and up to the challenge and tend to deepen their insight and widen their horizon; initial concerted and informed action act as a springboard to tackle more complex matters, and motivates and enables them to participate fully in public and political debate and incidence. This can be clearly noticed in the Alto Malleco MF, where political incidence was a strong driver of the local team to take part in EcoAdapt at the first place, and where this desired effect can be clearly observed now : actors in the two communes get more knowledgeable on water affairs, locally and nationally, get in touch with political representatives and join the movement to bring about some desired changes in the water policies and legal framework³⁸. This is entirely in line with the Chilean Laws of Transparency and Citizens Participation in Public Affairs and it gives these laws a concrete content. A similar development can be noticed in the other two territories although with specific and varying expressions because of different political and legal frameworks. For example, in Jujuy, the MF is working on strategies that can have political incidence on the agencies managing El Dique, and are also interested in building bridges with national-level actors, as they noticed there is a gap in this respect.

The challenge of improving water governance and channeling conflicts of interests and views

It is essential to improve water governance and create more effective and fair rules of the game with regards to access, use and the distribution of increasingly scarce water resources, due among others, to the effects of climate change. In last analysis, good governance and watershed management are critical means for durable

³⁷So, one can state: climate change adaptation for local development as well as local development for climate change.

³⁸ The newly elected Michelle Bachelet government may also provide an interesting political conjuncture for debate in matters of water policy and legal framework

climate change adaptation. (*Innovation in water governance* is a project aim and central part of the official project title, but in the conceptual framework of DoW, this dimension remained somehow in the shadow).

Water (scarcity) can be both a source of conflict and cooperation depending on the institutional arrangements and rules of the game in place³⁹. This is crucial to consider in view of the tendency of increasing water demand by different users and uses and diminishing water supply, in conditions of climate change. The fear of future conflicts around water was one of the reasons to select water and watershed ecosystem service (WES) as the central topic in EcoAdapt. Still, conflict is not necessarily an outcome of climate change. Actually, conflict around water could arise due to a myriad of other stressors that converge in the territories, such as increased water demand and pollution. Hence it is worthwhile to consider multiple drivers of change and analyze in what conditions and by what means increasing cooperation can be the outcome instead of increasing conflict. In this respect the EcoAdapt project can get some worthwhile inspiration and input from the groundbreaking 7th framework EU CLICO project *Climate Change, Hydro-conflicts and Human Security* (CLICO project flyer 2010 and policy brief no 2, 2012).

To enable fruitful debate and decision making on hot items such as governance, rules of the game and channeling conflicts of interest and optics in water use in a creative and constructive way, it is advisable to create firstly a sound basis of trust and cooperation around joint action in less conflictive matters. For this the analysis of synergy or conflict to identify entry points for action (deliverable 2.4 on Social and Institutional analysis) in the three territories is quite useful.

Looking backward and forward on the road to the project vision

One of the challenges in terms of connecting local development, policy debate and policy making is to link the immediate goal of satisfying felt needs of local actors with progress towards more complex and demanding changes, and action at higher levels of social aggregation. This is a matter of strategy and tactics. The accumulated experience so far is evidence that with intelligent acting it is quite feasible to combine those ends and means.

It is necessary to keep consulting and revising the road map outlined in the DoW, in light of new findings and reflection. The foreseen linkage between the activities with communities, with the involvement of policy makers, starts taking concrete shape. The same is true as to the projected political incidence at different levels of government.

The final objective of guaranteeing access to water in quality and quantity in spite of drought and other climatic events (stated within the theory of change of the project), cannot, and does not need to be reached within the project time span (rather, within 10 years). But it is fundamental to lay down the groundwork for it in terms of motivated, informed, committed and concerted massive cooperation and organization within the three territories, within the coming two years the project still has to go.

It is also essential to have the willingness and capability to start addressing and tackling some hot issues such as governance, rules of the game and conflict management around the access and use of water, which are a basis and condition to a great extent of the achievement of viable and real climate change adaptation. Therefore the project must promote clear thinking and informed action, but it should also be quite daring!

³⁹To date there are still well functioning millenarian water management systems like in the oasis of Arab desert countries or at a larger scale of cooperation and governance, the *sawahs* of irrigated terraces of rice production in East Asian countries which show the historical potential of cooperation in conditions of water scarcity and its use for food security.

Acknowledgements.

The authors would like to acknowledge Tahia Devisscher, Bastiaan Louman, Michael Kleine and Romy Cronembold for reviewing earlier versions of this paper. The paper benefited from the contributions of Raffaele Vignola who provided ideas and references that helped design the conceptual framework, Alejandra Real who systematized the fruitful November 2012 workshop in Chile, and Mariela Morales who has converted the deliverable 2.4 in Working Paper format. The authors are thankful to the ABMJ, BMMAM, and FCBC Model Forests teams and the local actors who have been participating in and giving their precious contributions to the information gathering, analysis and discussing, who converted the findings into outlines for action and patterns of organization and who in the process learned and got more clarity how to tackle the problems and take benefit of the development potential in their territories, in line with their aspirations and the project vision. This report reflects these processes and give them an added value..

This paper was prepared with support from the “Ecosystem-based strategies and innovations in water governance networks for adaptation to climate change in Latin American Landscapes” (EcoAdapt) research program funded by the European Commission under FP7 contract ENV.2011.4.2.3-1/283163. The contents of this document are the sole responsibility of the authors and can under no circumstances be regarded as reflecting the position of the European Union.

The authors assume the collective responsibility for the quality of the submitted and published work.

Consulted literature.

Adger W.N 2003 *Social capital, collective action and adaptation to climate change*. Economic Geography 79 (4) 387-404.

Argyris C, Schon D 1974. *Theory in Practice, Increasing professional effectiveness*. Jossey Bass, San Francisco, USA.

Ashby. J 2008: *Uniting Science and Participation in the Process of Innovation- Research for Development*. En IDRC Managing Natural Resources for Sustainable Livelihoods.

Ashley C, Carney D 1999: *Sustainable livelihoods: Lessons from early experience*. DFID London.

Ausubel D 2000, *Acquisition and retention of knowledge. A cognitive view*. Boston, Kluwer Academic Publishers.

Aziz Elbehri, Genest A, Burfischer M. 2011: *Global action on Climate Change in Agriculture: Linkages to Food Security, Markets and Trade Policies in Developing World*. FAO, Rome.

Blackmore C 2007 :*What kinds of knowledge, knowing and learning are required for addressing resource dilemmas? a theoretical overview*, Environmental Science & Policy 10 (2007) 512-525.

CLICO project flyer 2010, Kalis G, ICTA, Barcelona, Spain.

CLICO policy brief no 2, may 2011 (author Gerstretter C, Ecological Institute, Germany).

Crone B, Hubacek K, 2010: *The right connection: how do social networks lubricate the machinery of natural resource governance?* Ecology and society 15.4, guest editorial, publicado con licencia de Resilience Alliance .

Cashore B and Galloway G (lead authors) 2010: *Ability of Institutions to Address New Challenges*. En: Forests and Society, Responding to Global Drivers and Change. IUFRO World Series Volume 25

EcoAdapt 2011. *Description of work - Ecosystem-based strategies and innovations in water governance networks for adaptation to climate change in Latin American Landscapes*.

EcoAdapt 2012a. Vignola, R.; Morales, M.; Leclerc. G.; *Plan de Monitoreo y evaluación EcoAdapt*. 16 p.

EcoAdapt, 2012b. Jankowsky and Sabourin, (2013), *Intervención « Observación Participante « Participación Observante*, 55p.

EcoAdapt 2012c. Tupper S., 2012. *Variabilidad Climática y Eventos Extremos en la Cuenca Zapocó*, 28p.

EcoAdapt 2013a. E. de M; B. Loumaan; A. Real; C. Manchego; G. Leclerc; R. Vignola; S. Lewandowski; M. Morales; M. Curi; A.M. Valdivia; A. Fallot; R. Vides; J. Salinas; R. Anívaro; EcoAdapt, 2012. R. Cronenbold; N. Pacheco; A. Lobo; R. Schillinger; G. Giner; C. Chauque; V. Canedi; C. Sandoval; J. Jofre; W. Alvarado; J.F. Le Coq; T. Devisscher; D. Morchain: *Report of knowledge sharing workshops*. Versión inglesa. 68 p.

EcoAdapt 2013b. Devisscher. T, Cronenbold, R., Lobo, A., Pacheco, N., Salinas, J.C., Orellana, C., Linzer, K. Vignola, R., González, D., Real, A., Sandoval, C., Alvarado, W. Coll Besa, M., Canedi, V., Leclerc, G., Schillinger, R., De Melo, E., Chauque, C., Guerra, C., Cuevas, M: *Socio-Institutional Context Analysis BMCh-BMAAM-ABMJ*.

Ellis F: 2000. *Rural Livelihoods and Diversity in Developing Countries*. Oxford University Press, Oxford.

Freire P 1970. *Pedagogy of the Oppressed*. Sebury New York

Fundación de la Conservación del Bosque Chiquitano: *Boletín mensual* 2013, varios números

Greenwood D, Levin M, 1998: *Introduction to Action Research: Social Research for Social Change*, Sage Publications, London

Goldman, R., Thompson, B. and Daily, G. (2007) 'Institutional incentives for managing the landscape: Inducing cooperation for the production of ecosystem services', *Ecological Economics*, vol 64, pp333–343

Keeney, 1996, *Value-focused thinking: Identifying decision opportunities and creating alternatives*. European Journal of Operational Research 92 (1996) 537-549

L Krantz 2001: *The sustainable livelihoods approach to poverty reduction*. 37 p, SIDA.

H Kammerbauer, J Leon, N Castellon, S Gomez, M Gonzales, J Faustino, C Prins: 2009 *Una apuesta por la gobernalidad local. Experiencias y lecciones del programa FOCUENCAS en Honduras y Nicaragua*. Serietécnica, boletín técnico 31, CATIE.

Kolb D, 1986, *Experiential learning: experience as the source of learning and development*, Prentice Hall, Englewood Cliffs, NY.

Kuhn. 1962. *The structure of scientific revolutions*. International Encyclopedia of unified science, vol. 2 no 2. University of Chicago Press.

Meinzen-Dick R and M Di Gregorio M, 2004: *Collective action and property rights for sustainable development*. IFPRI. Washington.

Nashima D, Galloway Mclean K, Thulstrup H, Ramon Castillo A, Rubis j. 2012. *Weathering Uncertainty: Traditional Knowledge for Climate Assessment and Adaptation*, Paris Unesco y Darwin UNU 120 paginas.

Leon J y Prins C: 2010 *Gestión territorial para la protección colectiva del agua. Demarcación participativa de la zona productora de agua, Carrizalon, Honduras*. Serie técnico. Boletín técnico no 41. CATIE.

Long N 2001 *Development Sociology*, Routledge, London, NY.

De Melo E 2011: *Formulación, desarrollo y validación de modelo valorativo de los impactos de programas interinstitucionales de capacitación-aprendizaje con familias rurales en el marco de las redes de innovación*. Tesis de doctorado de la Universidad Estatal a Distancia, Costa Rica.

Nonaka I, Ichijo K, von Krogh G 2000, *Enabling knowledge creation*. NY Oxford University Press.

North D 1990, *Institutions, institutional change and economic performance*. Cambridge University Press. N.Y. USA

Ostrom E 1990 *Governing the commons, the evolution of institutions for collective action*. Cambridge University Press. .

Pahl-Wostl C 2009: *A conceptual framework for analyzing adaptive capacity and multi level learning process in resource governance regimes*. Global Environmental 19 (2009) 354-365, Elsevier.

Parrotta J, Agnoletti 2012: *Traditional Forest Related Knowledge and Climate Change: Sustaining communities, ecosystems & biocultural diversity*. IUFRO. Springer.

Pelling M, High C, 2005: *Social learning and adaptation to climate change*. Disaster Studies Working Paper 11, Benfield Hazard Research Centre. London.

Pretty, J. 1995 : *Regenerative agriculture. Policies and practices for sustainability and self reliance*. Earthscan, London.

Prins C 1997: *Proceso y Producto. Un Balance*. Escuela de Desarrollo, Lima, Peru, 1997.

Prins C, Lok R, Current D: 1999 *Cambio e innovación tecnológica en tiempos de escases, estrés y nuevas oportunidades*. Ponencia en Semana Científica de CATIE.

Prins C 1999: *¿Cómo insertar nuevas tecnologías en sistemas de producción de familias campesinas?* Agroforestería en las Américas, vol 6 no 21: la Extensión agroforestal.

Prins C: 2005: *Procesos de innovación rural en América Central: reflexiones y aprendizajes*. Serie técnica no 337, CATIE, 243 páginas.

Prins C 2009: *Experiencias y reflexiones sobre la gobernanza de los recursos naturales en las subcuencas de aprendizaje en Honduras y Nicaragua por el programa FOCUENCAS II del CATIE*. En: Conferencia electrónica sobre: *Desarrollo Rural Territorial y Gobernanza de los Recursos. Reflexiones en los Andes*. CONDESAN. Lima, Peru. 2009.

Prins C 2011 *Fuerzas y procesos de innovación tecnológica. Su incidencia en el desarrollo rural*. Ponencia en seminario internacional de la Universidad Javeriana, Bogotá, Colombia, abril 2011, sobre Innovación y Desarrollo Rural en América Latina)

Prins C, Castellon N 2010: *Corrientes de agua y de cambio en la subcuenca del río Jucuapa, Nicaragua*, LEISA, revista agroecológica, octubre de 2010.

Prins C, Leon J. 2010 : *Securing the continuous supply of drinking water in a territory requires concerted actions and integrating intervention strategies: a case study in copanruinas, Honduras*, in: Rapidel B, DeClerck F, Le Coq J-F and John Beer J (Eds) *Ecosystem Services from Agriculture and Agroforestry: Measurement and Payment*, Earthscan, London.

Rayner J, Buck A, Katila P (eds) 2010: *Embracing complexity: Meeting the challenges of international forest governance. A global assessment report. Prepared by the Global Forest Expert Panel on the International Forest Regime. IUFRO Word Series Volume 28, Viena 172 pages.*

Röling N, Wagemakers N (Ed) 1998: *Facilitating sustainable agriculture, participatory learning and adaptive management in times of environmental uncertainty.* Cambridge University Press.

Roux D, Murray K, van Wyk (2007): *Principles enabling learning environment for good ecosystem governance*, in Turton AR, Hattingh HJ, Maree GA, Roux DJ, Claassen M, Strydom WF (Eds) : *Governance as a Dialogue: Government- Society-Science in Transition.* Springer: 253-280.

Salafsky N, Margoluis, Redford Kent R 2001: *Adaptive management. A tool for conservation practitioners* .World Wildlife Fund, Washington D.C

Sen A 1999: *Development as Freedom*, Oxford University Press.

Senge P 1990 :*The fifth discipline – The art and practice of the learning organization.* London: Century Business.

Steyaert P, Jiggins J, 2007: *Governance of complex environmental situations through social learning: a synthesis of SLIM's lessons for research, policy and practice.* Environmental Science and Policy 10, 575-586, Elsevier.

Vanclay J. Prabhu R, Sinclair F, 2006: *Realizing community futures. A practical guide to harnessing natural resources.* Earthscan, London

Vignola R, McDaniels, Scholz R, 2013: *Governance structures for ecosystem-based adaptation: Using policy-network analysis to identify key organizations for bridging information across scales and policy areas.* Environmental Science and Policy 31 (2013) 71-84

Vorley B, Pozo-Verguez E, Barnett, 2013: *Agricultores de pequeña escala en el mercado globalizado: tomando decisiones en un mundo cambiante.* International Institute for International Development (IIED), London

Wenger E 1998: *Communities of Practice- Learning in Meaning and Identity*, Cambridge University Press.